Access DB# 105828

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Jonathan Crepeau Examiner # : 75637 Date: 10/9/03
Art Unit: 1746 Phone Number 305 0051 Serial Number: 09/848823
Mail Box and Bldg/Room Location: CP3 7E01 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

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Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: FUEL CELL ANODE CONFIGURATION FOR CO TOLERANCE

Inventors (please provide full names): Francisco Uribe; Thomas Zawodzinski

Earliest Priority Filing Date: 5/3/01

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

A material which is disclosed as useful for catalyzing carbon monoxide oxidation in a hydrogen-rich gas (e.g. a fuel cell reformate), the material consisting of elemental Cu, Fe, Co, Tb, W, Mo, Sn, oxides thereof, or combinations thereof.

10

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STAFF USE ONLY		Type of Search		Vendors and cost where applicable	
Searcher:	ES	NA Sequence (#)		STN	$170.77
Searcher Phone #:		AA Sequence (#)		Dialog	
Searcher Location:		Structure (#)	✓ (1)	Questel/Orbit	
Date Searcher Picked Up:		Bibliographic	✓ (and)	Dr.Link	
Date Completed:	10-10-03	Litigation		Lexis/Nexis	
Searcher Prep & Review Time:	5	Fulltext		Sequence Systems	
~~Clerical Prep Time:~~		Patent Family		WWW/Internet	
Online Time:	85	Other		Other (specify)	

PTO-1590 (8-01)

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FILE 'REGISTRY' ENTERED AT 15:44:12 ON 10 OCT 2003
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     FILE 'REGISTRY' ENTERED AT 15:05:04 ON 10 OCT 2003
                      E COPPER/CN
L1                  1 SEA COPPER/CN
                      E IRON/CN
L2                  1 SEA IRON/CN
                      E COBALT/CN
L3                  1 SEA COBALT/CN
                      E TERBIUM/CN
L4                  1 SEA TERBIUM/CN
                      E TUNGSTEN/CN
L5                  1 SEA TUNGSTEN/CN
                      E MOLYBDENUM/CN
L6                  1 SEA MOLYBDENUM/CN
                      E TIN/CN
L7                  1 SEA TIN/CN
L8               1420 SEA ((CU OR FE OR CO OR TB OR W OR MO OR SN)(L)O)/ELS
                      (L) 2/ELC.SUB
                      E CARBON MONOXIDE/CN
L9                  1 SEA "CARBON MONOXIDE"/CN

     FILE 'HCA' ENTERED AT 15:12:08 ON 10 OCT 2003
L10             37525 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L11                   QUE CAT# OR CATALY?
L12            169139 SEA L9 OR CARBON#(A)MONOXIDE# OR CO(2A)(GAS## OR
                      GASEOUS? OR GASIF? OR ATM# OR ATMOS? OR STREAM? OR FLOW
                      OR FLOWS OR FLOWED OR FLOWING# OR APPLY? OR APPLICATION?
                      OR APPLIED OR INTRODUC? OR TREAT? OR PRETREAT? OR
                      PROCESS? OR INJECT? OR SYRING? OR JET OR JETS OR NEEDL?)

     FILE 'REGISTRY' ENTERED AT 15:14:08 ON 10 OCT 2003
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L13                 1 SEA HYDROGEN/CN
                      E OXYGEN/CN
L14                 1 SEA OXYGEN/CN

     FILE 'HCA' ENTERED AT 15:14:30 ON 10 OCT 2003
L15            732258 SEA L13 OR HYDROGENA? OR H2 OR (HYDROGEN# OR H)(2A)(GAS##
                       OR GASEOUS? OR GASIF? OR ATM# OR ATMOS? OR STREAM? OR
                      FLOW OR FLOWS OR FLOWED OR FLOWING# OR APPLY? OR
                      APPLICATION? OR APPLIED OR INTRODUC? OR TREAT? OR
                      PRETREAT? OR PROCESS? OR INJECT? OR SYRING? OR JET OR
                      JETS OR NEEDL?)
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L16      1284987 SEA L14 OR OXYGENA? OR O2 OR (OXYGEN# OR O)(2A)(GAS## OR
                 GASEOUS? OR GASIF? OR ATM# OR ATMOS? OR STREAM? OR FLOW
                 OR FLOWS OR FLOWED OR FLOWING# OR APPLY? OR APPLICATION?
                 OR APPLIED OR INTRODUC? OR TREAT? OR PRETREAT? OR
                 PROCESS? OR INJECT? OR SYRING? OR JET OR JETS OR NEEDL?)
                 OR AIR
L17       444366 SEA L1
L18       377957 SEA L2
L19       156302 SEA L3
L20        21949 SEA L4
L21        81058 SEA L5
L22       106359 SEA L6
L23        83097 SEA L7
L24       174236 SEA L8
L25          270 SEA L10 AND L11 AND L12 AND L15 AND L16
L26           31 SEA L25 AND L17
L27           17 SEA L25 AND L18
L28           20 SEA L25 AND L19
L29            2 SEA L25 AND L20
L30            6 SEA L25 AND L21
L31            9 SEA L25 AND L22
L32            3 SEA L25 AND L23
L33           23 SEA L25 AND L24
L34         3689 SEA PEM OR P(W)E(W)M OR POLYM?(3A)ELECTROLY?(3A)MEMBRAN?
L35       104030 SEA (OXIDA? OR OXIDI? OR OXIDN#)(2A)(CAT# OR CATALY?)
L36            4 SEA L26 AND L34
L37           16 SEA L26 AND L35
L38            1 SEA L28 AND L34
L39           10 SEA L28 AND L35
L40            6 SEA L33 AND L34
L41           14 SEA L33 AND L35
L42           18 SEA L10 AND L11 AND L15 AND L16 AND L34 AND L35
L43            8 SEA L42 AND ((L17 OR L18 OR L19 OR L20 OR L21 OR L22 OR
                 L23 OR L24))
L44           14 SEA L26 AND L28
L45        38525 SEA REFORM? OR RE(W)FORM?
L46            6 SEA L43 AND L45
L47           20 SEA L26 AND L45
L48            9 SEA L28 AND L45
L49            7 SEA L27 AND L45
L50           17 SEA L33 AND L45
L51           30 SEA L29 OR L30 OR L31 OR L32 OR L36 OR L38 OR L40 OR L43
                 OR L46 OR L48 OR L49
L52           27 SEA (L27 OR L37 OR L39 OR L41 OR L44 OR L50) NOT L51
L53            8 SEA (L33 OR L47) NOT (L51 OR L52)


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=> d l51 1-30 cbib abs hitstr hitind B.D.

L51 ANSWER 1 OF 30 HCA COPYRIGHT 2003 ACS on STN
139:199933 Selective **catalytic** oxidation of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures. Chang, Bong-Kyu; Chen, Laiyuan; Tatarchuk, Bruce J. (Center for Microfibrous Materials Manufacturing, Department of Chemical Engineering, Auburn University, Auburn, AL, 36849-5127, USA). Annual Meeting Archive - American Institute of Chemical Engineers, Indianapolis, IN, United States, Nov. 3-8, 2002, 2613-2626. American Institute of Chemical Engineers: New York, N. Y. (English) 2002. CODEN: 69DXW7.

AB The sintered microfibrous materials technol. developed in the lab. is examd. for application to selective **catalytic** oxidn. of CO in simulated **fuel cell** gas environment. The overall objective is to develop a novel **catalyst** material for effective removal of small amts. (1-2%) of CO present in the **H2**-rich gas produced by partial oxidn. or steam **reforming** of hydrocarbons for **fuel cell** applications. The study is divided into two distinct parts. First, the most effective **catalyst** formulation(s) are identified, based upon screening of various metal/support combinations and prepn. techniques. The 2nd part of the study focuses on incorporation of identified **catalysts** into the sintered microfibrous materials technol., with emphasis on adaptation of conventional prepn. methods for microfibrous materials. The performance of prepd. microfibrous **catalyst** is compared to conventional **catalyst** materials.

IT **7440-48-4**, Cobalt, uses
(, plain and with gold, supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0**, Hydrogen (**H2**), uses
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, reactions

(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IT **630-08-0, Carbon monoxide**, reactions
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST **catalysis** selective oxidn CO **fuel cell** microfibrous encapsulated **catalyst**; oxide **catalyst** support promoter **carbon monoxide fuel cell** cleanup

IT **Fuel cells**
(CO removal from **hydrogen stream** for; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT Y zeolites
(gold and ruthenium support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT Microfibers
(network in **catalyst** composite; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT Oxides (inorganic), uses
(promoters; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT **Catalyst** supports
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT Oxidation **catalysts**
(selective; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT Zeolite 13X

Zeolite 4A
(support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT **7440-48-4**, Cobalt, uses
(, plain and with gold, supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1344-43-0, Manganese oxide (MnO), uses
(CeO2- supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-22-4, Silver, uses
(Co3O4 -supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-05-3, Palladium, uses
(Fe2O3 - and mixed ceria-titania supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 12612-41-8, Hopcalite
(**catalyst** and support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1307-96-6, Cobalt oxide (CoO), uses
(ceria- supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1314-13-2, Zinc oxide (ZnO), uses 11129-60-5, Manganese oxide (MnOx)
(gold support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1317-38-0, Copper oxide, uses
(mixed oxide with CeO2; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1306-38-3, Cerium oxide (CeO2), uses
(mixed oxides with CuO, CoO, or MnO, platinum support with TiO2; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-18-8, Ruthenium, uses
(plain and with platinum, supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-06-4, Platinum, uses
(plain and with ruthenium, supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 18282-10-5, Tin dioxide (SnO2)

(platinum support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 124-38-9, Carbon dioxide, uses
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT **1333-74-0**, Hydrogen (**H2**), uses
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT **7782-44-7**, Oxygen, reactions
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT **630-08-0**, **Carbon monoxide**, reactions
(selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1308-06-1, Cobalt oxide (Co3O4)
(silver support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-02-0, Nickel, uses
(sintered microfibrous encapsulation net; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7631-86-9, Silica, uses 13463-67-7, Titanium oxide (TiO2), uses
(support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-57-5, Gold, uses
(supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 7440-45-1, Cerium, uses
(with gold, manganese oxide-supported; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1309-37-1, Iron oxide (Fe2O3), uses
(.alpha.-, support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

IT 1344-28-1, Aluminum oxide (Al2O3), uses
(.gamma.-, support; selective **catalytic** oxidn. of CO in **fuel cell** applications using microfibrous encapsulated **catalyst** structures)

L51 ANSWER 2 OF 30 HCA
138:290421 Methods of producing oxygen reduction **catalyst** for

Bad Filing date

fuel cell and battery use. Lefebvre, Mark C. (USA). U.S. Pat. Appl. Publ. US 2003069129 A1 20030410, 15 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-973490 20011009.

AB Methods of making an oxygen redn. **catalyst** are described in which carbon black, one or more metal-contg. and/or nitrogen-contg. precursor(s) are provided to a reaction zone, and the carbon black is rendered **catalytically** active. To form this **catalytic** activity, the carbon black and one or more metal-contg. and/or nitrogen-contg. precursor(s) are introduced to a reaction zone heated to a temp. of 600-1000.degree., and maintained together in the reaction zone for a cumulative time between 5 s and 240 min.

IT **7439-98-7**, Molybdenum, uses **7439-98-7D**, Molybdenum, salts
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

IT **630-08-0**, **Carbon monoxide**, processes
1333-74-0, **Hydrogen**, **processes**
7782-44-7, **Oxygen**, **processes**
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IC ICM B01J021-18

ICS H01M004-96
NCL 502180000; 502182000; 502183000; 502184000; 502185000; 429044000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67, 72
ST **fuel cell** cathode **catalyst** oxygen redn
IT Primary batteries
(Zn-**air**; methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Reduction **catalysts**
(electrochem.; methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Electric furnaces
(induction; methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Macrocyclic compounds
(metal; methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Battery cathodes
Fuel cell cathodes
Fuel cells
Furnaces
Reducing agents
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Actinide compounds
Actinides
Alkali metal salts
Alkali metals, uses
Alkaline earth metals
Alkaline earth salts
Rare earth metals, uses
Rare earth salts
Transition metal salts
Transition metals, uses
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT Carbon black, uses
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)
IT 57-13-6D, Urea, salts 75-05-8D, Acetonitrile, salts 302-01-2D, Hydrazine, salts 7439-89-6, Iron, uses 7439-89-6D, Iron, salts 7439-96-5, Manganese, uses 7439-96-5D, Manganese, salts **7439-98-7**, Molybdenum, uses **7439-98-7D**, Molybdenum, salts 7440-02-0, Nickel, uses 7440-02-0D, Nickel, salts 7440-16-6, Rhodium, uses 7440-16-6D, Rhodium, salts 7440-18-8, Ruthenium, uses 7440-18-8D, Ruthenium, salts 7440-47-3, Chromium, uses 7440-47-3D, Chromium, salts 7440-48-4, Cobalt, uses 7440-48-4D, Cobalt, salts 7440-50-8, Copper, uses 7440-50-8D, Copper, salts 7440-62-2, Vanadium, uses 7440-62-2D, Vanadium, salts 7440-66-6, Zinc, uses 7440-66-6D, Zinc, salts 7664-41-7, Ammonia, uses

(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

IT **630-08-0**, **Carbon monoxide**, processes
1333-74-0, **Hydrogen**, **processes**
7782-44-7, **Oxygen**, **processes**
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

IT 7782-50-5P, Chlorine, preparation
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

IT 7440-37-1, Argon, uses 7440-59-7, Helium, uses 7727-37-9, Nitrogen, uses
(methods of producing oxygen redn. **catalyst** for **fuel cell** and battery use)

L51 ANSWER 3 OF 30 HCA COPYRIGHT 2003 ACS on STN B.D.

138:287174 Potential Application of Tungsten Carbides as Electrocatalysts: 4. Reactions of Methanol, Water, and **Carbon Monoxide** over Carbide-Modified W(110).

Hwu, Henry H.; Chen, Jingguang G. (University of Delaware, Newark, DE, 19716, USA). Journal of Physical Chemistry B, 107(9), 2029-2039 (English) 2003. CODEN: JPCBFK. ISSN: 1520-6106. Publisher: American Chemical Society.

AB The reactions of methanol, water, and **carbon monoxide** over clean and carbide-modified W(110) are studied by temp.-programmed desorption, high-resoln. electron energy loss spectroscopy, and Auger electron spectroscopy . The product selectivity of methanol on unmodified W(110) is 67.5% toward complete decompn., 8.5% toward CO, and 24% toward CH4. After the W(110) surface is modified by carbon, the complete decompn. pathway decreases to 58%, with the remaining methanol dissocg. to produce approx. equal amts. of CO and CH4. On W(110), the no. of H2O mols. undergoing dissocn. is detd. to be 0.320 water mols. per W atom. Upon carbon modification, the activity of water decreases by half to 0.153 mols. per W atom. The study of CO on W(110) shows three reaction pathways: decompn. to surface C and **O**, formation of **gas**-phase CO2, and mol. desorption at 284 and 335 K. On the C/W(110) surface, only 7% of the adsorbed CO decomps. to produce surface C and O; addnl., no CO2 desorption is detected. The preadsorption of water onto C/W(110) does not appear to affect the amt. of CO adsorption, but does lead to CO desorbing at the lower temp. of 271 K. These results are compared to our previous studies on W(111) and C/W(111) to det. the effect of substrate structure on the reaction pathways of methanol, water, and CO.

IT **7440-33-7**, Tungsten, uses **7440-33-7D**, Tungsten, carbide-modified
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

RN 7440-33-7 HCA

CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

RN 7440-33-7 HCA
CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

IT **630-08-0**, **Carbon monoxide**, reactions
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IT **1333-74-0**, Hydrogen, formation (nonpreparative)
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

CC 22-8 (Physical Organic Chemistry)
Section cross-reference(s): 66, 67, 73
ST methanol water **carbon monoxide** reaction carbide modified tungsten HREELS
IT Isotope effect
(deuterium; reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)
IT **Catalysts**
(electrocatalysts, potential application of tungsten carbides as **fuel cell** electrocatalysts; reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)
IT Electron energy loss spectroscopy
(high-resoln.; reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT Adsorption
(of **carbon monoxide**; reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT Adsorbed substances
Auger electron spectra
Decomposition
Decomposition **catalysts**
Molecular vibration
Surface reaction
Vibrational frequency
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT Desorption
(thermal, temp.-programmed; reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT **7440-33-7**, Tungsten, uses **7440-33-7D**, Tungsten, carbide-modified
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT 67-56-1, Methanol, reactions **630-08-0**, **Carbon monoxide**, reactions 811-98-3, Methanol-d4 1849-29-2, Methan-d3-ol 7732-18-5, Water, reactions 7789-20-0, Water-d2
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT 74-82-8, Methane, formation (nonpreparative) **1333-74-0**, Hydrogen, formation (nonpreparative)
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT 2143-68-2, Methoxy 7263-60-7, Methoxy-d3
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

IT 7782-39-0, Deuterium, properties
(reactions of methanol, water, and **carbon monoxide** over carbide-modified tungsten studied by temp.-programmed desorption, HREELS, and Auger electron spectroscopy)

L51 ANSWER 4 OF 30 HCA

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no good Rem. mem.

137:355019 Hydrogen purification apparatus for removal of **carbon monoxide** from **reforming** gas.. Taguchi, Kiyoshi; Ukai, Kunihiro; Fujiwara, Seiji; Tomizawa, Takeshi; Wakita, Hidenobu (Matsushita Electric Industrial Co., Ltd., Japan). PCT Int. Appl. WO 2002090248 A1 20021114, 47 pp. DESIGNATED STATES: W: CN, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2002-JP4229 20020426. PRIORITY: JP 2001-136625 20010507; JP 2001-210427 20010711.

AB The title app. comprises a **reforming** gas supply section for supplying H- and **CO**-contg. **reforming gas**, an oxidizing gas supply section for mingling an oxidizing gas into the **reforming** gas, and a **catalyst** purifn. element. The **catalyst** purifn. element includes a 1st **catalyst** selected from Pt, Pd, Ru and Rh, a 2nd **catalyst** selected from Pd, Ru, Rh and Ni, and the 1st and 2nd **catalysts** are mixed or combined in one piece; wherein an alumina or a zeolite, which is ion-exchanged with a 1st period transition metal (i.e., Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, or Zn), is used as the heat-resistant **catalyst** support base material, and the **catalyst** element is in the form of pellets or a honeycomb structure. The **catalyst** purifn. element may include 2 sections; the temps. of the **catalyst** purifn. element and **H gas** are detected, resp.; and the supply of the oxidizing gas is controlled. The purified H can be used as **fuel** for **fuel cells**.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses
(**catalyst** contg.; hydrogen purifn. app. for removal of **carbon monoxide** from **reforming** gas)

RN 7439-89-6 HCA

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0P**, Hydrogen, preparation
(hydrogen purifn. app. for removal of **carbon monoxide** from **reforming** gas)

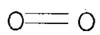
RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, **Oxygen**, reactions
(oxidizing **gas** contg.; **hydrogen** purifn. app.

for removal of **carbon monoxide** from
reforming gas)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**,
processes
(removal of; **hydrogen** purifn. app. for removal of
carbon monoxide from **reforming** gas)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

IC ICM C01B003-32
ICS C01B003-40; B01J023-46; B01J023-89; H01M008-06
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 51, 52, 67
ST hydrogen purifn app **carbon monoxide** removal
reforming gas **catalyst**; **fuel**
cell hydrogen purifn app **reforming** gas
IT Zeolites (synthetic), uses
(**catalyst** support; hydrogen purifn. app. for removal of
carbon monoxide from **reforming** gas)
IT **Catalyst** supports
Catalysts
Water gas shift reaction **catalysts**
(hydrogen purifn. app. for removal of **carbon**
monoxide from **reforming** gas)
IT **Fuel cells**
(hydrogen purifn. app. for removal of **carbon**
monoxide from **reforming** gas for)
IT **7439-89-6**, Iron, uses 7439-96-5, Manganese, uses
7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4,
Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium,
uses 7440-20-2, Scandium, uses 7440-32-6, Titanium, uses
7440-47-3, Chromium, uses **7440-48-4**, Cobalt, uses
7440-50-8, Copper, uses 7440-62-2, Vanadium, uses 7440-66-6,
Zinc, uses
(**catalyst** contg.; hydrogen purifn. app. for removal of
carbon monoxide from **reforming** gas)
IT 1344-28-1, Alumina, uses
(**catalyst** support; hydrogen purifn. app. for removal of
carbon monoxide from **reforming** gas)
IT **1333-74-0P**, Hydrogen, preparation
(hydrogen purifn. app. for removal of **carbon**
monoxide from **reforming** gas)
IT **7782-44-7**, **Oxygen**, reactions

(oxidizing **gas** contg.; **hydrogen** purifn. app. for removal of **carbon monoxide** from **reforming** gas)

IT **630-08-0**, **Carbon monoxide**, **processes**
(removal of; **hydrogen** purifn. app. for removal of **carbon monoxide** from **reforming** gas)

water shift

L51 ANSWER 5 OF 30 HCA COPYRIGHT 2003 ACS on STN
137:281654 Fuel processor and method for generating hydrogen for **fuel cells**. Ahmed, Shabbir; Lee, Sheldon; Carter, John; Krumpelt, Michael (University of Chicago, USA). PCT Int. Appl. WO 2002076883 A1 20021003, 50 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, ~~BA, BB,~~ BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US4685 20020207. PRIORITY: US 2001-816676 20010323.

AB A method of producing a **H2** rich gas stream includes supplying an **O2** rich gas, steam, and fuel to an inner **reforming** zone of a fuel processor that includes a partial oxidn. **catalyst** and a steam **reforming catalyst** or a combined partial oxidn. and stream **reforming catalyst**. The method also includes contacting the **O2** rich gas, steam, and fuel with the partial oxidn. **catalyst** and the steam **reforming** cultist or the combined partial oxidn. and stream **reforming catalyst** in the inner **reforming** zone to generate a hot **reformate** stream. The method still further includes cooling the hot **reformate** stream in a cooling zone to produce a cooled **reformate** stream. Addnl., the method includes removing sulfur-contg. compds. from the cooled **reformate** stream by contacting the cooled **reformate** stream with a sulfur removal agent. The method still further includes contacting the cooled **reformate** stream with a **catalyst** that converts water and **carbon monoxide** to carbon dioxide and **H2** in a water-gas-shift zone to produce a final **reformate** stream in the fuel processor.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses
(fuel processor and method for generating hydrogen for **fuel cells**)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0P**, **Hydrogen**, preparation
(fuel **processor** and method for generating hydrogen for **fuel cells**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IC ICM C01B003-32
ICS C01B003-38; C01B003-48; C01B003-58; B01J008-04; C01B003-40
CC 51-11 (Fossil Fuels, Derivatives, and Related Products)
ST hydrogen generation **fuel cell**
IT **Catalyst** supports
Fuel cells
Steam **reforming catalysts**
Water gas shift reaction **catalysts**
(**fuel** processor and method for generating hydrogen for **fuel cells**)
IT Oxidation **catalysts**
(partial; fuel processor and method for generating hydrogen for **fuel cells**)
IT 7440-54-2, Gadolinium, uses
(ceria doped with; fuel processor and method for generating hydrogen for **fuel cells**)
IT 7439-88-5, Iridium, uses **7439-89-6**, Iron, uses 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-22-4, Silver, uses **7440-48-4**, Cobalt, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 12160-53-1, Gallium lanthanum oxide (GaLaO3) 12597-68-1, Stainless steel, uses
(fuel processor and method for generating hydrogen for **fuel cells**)
IT **1333-74-0P**, **Hydrogen**, preparation
(fuel **processor** and method for generating hydrogen for **fuel cells**)
IT 1314-13-2, Zinc oxide, uses
(fuel processor and method for generating hydrogen for **fuel cells**)
IT 7704-34-9, Sulfur, processes
(fuel processor and method for generating hydrogen for **fuel cells**)
IT 1306-38-3, Ceria, uses
(gadolinium-doped, **catalyst** support; fuel processor and method for generating hydrogen for **fuel cells**

)

L51 ANSWER 6 OF 30 HCA COPYRIGHT 2003 ACS on STN Bad date (declaration)
137:265520 **Carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**. Muller, Bernd (Gustavsburg, Germany). Fortschritt-Berichte VDI, Reihe 6: Energietechnik, 466, i-x, 1-114 (German) 2001. CODEN: FVENFU. ISSN: 0178-9414. Publisher: VDI Verlag GmbH.

AB The **H2**-rich gas, produced from fossil fuels by the **reforming** process, for **fuel cell** application contained low amts. of the **catalyst** poisoning CO. The poisoning of the **catalyst** by CO suppressed the anodic **H2** oxidn. and decreased the performance of the **polymer membrane electrolyte fuel cell** (PEFC) significantly. The tech. potential to improve the CO tolerance of the PEFC was investigated theor., and the results were verified exptl. by the measurement of current/voltage curves. The CO poisoning of the **catalyst** was detd. by electrochem. impedance spectroscopy, and by the developed impedance model it was possible to sep. the potential differences of the single components. This procedure allowed the description of the phys. and electrochem. processes at the anode of the PEFC during CO poisoning. The increase of the cell temp. increased the CO tolerance of the Pt-anode, and by **air**-bleeding the CO could be oxidized, while the use of CO-tolerant electrodes was accompanied with lower current densities.

IT **7439-98-7**, Molybdenum, uses
(**carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)

RN 7439-98-7 HCA

CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

IT **1333-74-0**, **Hydrogen**, uses
(fuel **gas** contg.; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, **processes**
(**hydrogen** fuel **gas** contg. impurities of; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)

RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67, 72, 76
ST **carbon monoxide** poisoning **fuel cell** anode **oxidn catalyst**
IT Current density
Electric current-potential relationship
Fuel cell anodes
Poisoning, **catalytic**
(**carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT **Oxidation catalysts**
(electrochem.; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT Fuel **gases**
(**hydrogen** with **CO** impurities; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT **Fuel cells**
(polymer membrane; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT Electric impedance
(spectroscopy; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT **7439-98-7**, Molybdenum, uses 7440-06-4, Platinum, uses
7440-18-8, Ruthenium, uses 12714-36-2 60501-15-7
(**carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)
IT **1333-74-0**, **Hydrogen**, uses
(fuel **gas** contg.; **carbon monoxide**

poisoning of **catalysts** in polymer electrolyte **fuel cells**)

IT **630-08-0**, **Carbon monoxide**, **processes**
(**hydrogen** fuel **gas** contg. impurities of; **carbon monoxide** poisoning of **catalysts** in polymer electrolyte **fuel cells**)

water shift

L51 ANSWER 7 OF 30 HCA COPYRIGHT 2003 ACS on STN
137:265379 Generation of hydrogen by fuel **reforming** for **fuel cells**. Ahmed, Shabbir; Krumpelt, Michael (University of Chicago, USA). PCT Int. Appl. WO 2002076882 A2 20021003, 26 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US3690 20020207. PRIORITY: US 2001-816694 20010323.

AB A **H2**-rich gas is generated by **reforming** a fuel mixt. consisting of mol. oxygen (**air**), fuel, and water in the presence of an autothermally **reforming** **catalyst** at 400-700.degree.C. The fuel can be methane, natural gas, propane, ethanol, liquefied petroleum gas, gasoline, kerosene, and diesel. The **catalyst** contains a transition metal, such as Pt, Pd, Ru, Rh, Ir, Fe, Co, Ni, Cu, Ag, or Au and an oxide ion-conducting ceramic material crystd. in a fluorite structure or LaGaO3. The obtained **H2**-rich gas is brought into contact with a second **catalyst** to convert CO and H2O into CO2 and **H2**. The second **catalyst** consists of a transition metal, such as Pt, Pd, Ni, Ir, Rh, Co, Cu, Ag, Au, Ru, or Fe, on ceria or ceria doped with a rare earth or alk. earth element, such as Gd, Sm, Y, La, Pr, Mg, Ca, Sr, or Ba.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses
(generation of hydrogen by fuel **reforming** for **fuel cells**)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0P**, Hydrogen, preparation

(generation of hydrogen by fuel **reforming** for
fuel cells)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0, Carbon monoxide**, reactions
(generation of hydrogen by fuel **reforming** for
fuel cells)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B003-02
CC 51-11 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 52, 67
ST hydrogen manuf hydrocarbon fuel **reforming catalyst**
fuel cell
IT Natural gas, reactions
(fuel; generation of hydrogen by fuel **reforming** for
fuel cells)
IT Petroleum products
(gases, liquefied, fuel; generation of hydrogen by fuel
reforming for **fuel cells**)
IT Diesel fuel
Fuel cells
Reforming catalysts
(generation of hydrogen by fuel **reforming** for
fuel cells)
IT Gasoline
Kerosene
(generation of hydrogen by fuel **reforming** for
fuel cells)
IT Fuel gas manufacturing
(**reforming**; generation of hydrogen by fuel
reforming for **fuel cells**)
IT 7439-91-0, Lanthanum, uses 7439-95-4, Magnesium, uses 7440-10-0,
Praseodymium, uses 7440-19-9, Samarium, uses 7440-24-6,
Strontium, uses 7440-39-3, Barium, uses 7440-54-2, Gadolinium,
uses 7440-65-5, Yttrium, uses 7440-70-2, Calcium, uses
(dopant; generation of hydrogen by fuel **reforming** for
fuel cells)
IT 64-17-5, Ethanol, reactions 67-63-0, Iso-propanol, reactions
71-23-8, n-Propanol, reactions 71-43-2, Benzene, reactions
74-82-8, Methane, reactions 74-84-0, Ethane, reactions 74-85-1,
Ethylene, reactions 74-98-6, Propane, reactions 106-97-8,
Butane, reactions 108-88-3, Toluene, reactions 109-66-0,
Pentane, reactions 110-54-3, Hexane, reactions 110-82-7,

Cyclohexane, reactions 115-07-1, Propene, reactions 287-92-3, Cyclopentane 540-84-1, Iso-octane 1330-20-7, Xylene, reactions 25167-67-3, Butene 25377-72-4, Pentene 35296-72-1, Butanol
(fuel; generation of hydrogen by fuel **reforming** for **fuel cells**)

IT 1306-38-3, Ceria, uses 7439-88-5, Iridium, uses **7439-89-6**, Iron, uses 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-22-4, Silver, uses **7440-48-4**, Cobalt, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 12160-53-1, Gallium lanthanum oxide galao3
(generation of hydrogen by fuel **reforming** for **fuel cells**)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
(generation of hydrogen by fuel **reforming** for **fuel cells**)

IT **1333-74-0P**, Hydrogen, preparation
(generation of hydrogen by fuel **reforming** for **fuel cells**)

IT **630-08-0**, **Carbon monoxide**, reactions 7732-18-5, Water, reactions
(generation of hydrogen by fuel **reforming** for **fuel cells**)

has Pt ~~looks good~~ questionable date parent app viewed does not have PrOx catalyst

L51 ANSWER 8 OF 30 HCA COPYRIGHT 2003 ACS on STN
137:203942 Platinum group metal promoted copper **oxidation catalysts** and methods for **carbon monoxide** remediation. Shore, Lawrence; Ruettinger, Wolfgang F.; Farrauto, Robert J. (USA). U.S. Pat. Appl. Publ. US 2002122764 A1 20020905, 18 pp., Cont.-in-part of U.S. Ser. No. 771,812. (English). CODEN: USXXCO. APPLICATION: US 2001-35525 20011109. PRIORITY: US 2000-669044 20000925; US 2001-771812 20010129.

AB The invention provides processes for selectively oxidizing **carbon monoxide** from an input gas stream that contains **carbon monoxide**, oxygen and hydrogen. The process includes the step of contacting the input gas stream with a preferential **oxidn. catalyst.** The preferential **oxidn. catalysts** are copper-based **catalysts** contg. low concns. of platinum group metals. In some embodiments, the processes of the invention are conducted using preferential **oxidn. catalysts** having an oxide support on which is dispersed copper or an oxide thereof, a platinum group metal and a reducible metal oxide. In other embodiments, the processes of the invention are conducted with a preferential **oxidn. catalysts** having a cerium oxide support on which is dispersed copper or an oxide thereof and a platinum group metal. The method is useful for removing **carbon monoxide** from **hydrogen** feed **streams** for proton exchange membrane (**PEM**) **fuel cells.**

IT **1307-96-6**, Cobalt oxide, uses **1313-27-5**, Molybdenum oxide, uses **7440-50-8**, Copper, uses

(platinum group metal promoted copper **oxidn.** **catalysts** and methods for **carbon** **monoxide** remediation)

RN 1307-96-6 HCA
CN Cobalt oxide (CoO) (8CI, 9CI) (CA INDEX NAME)

Co=O

RN 1313-27-5 HCA
CN Molybdenum oxide (MoO3) (7CI, 8CI, 9CI) (CA INDEX NAME)

```
      O
      ||
O==Mo==O
```

RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1317-38-0**, Copper oxide (CuO), uses
(platinum group metal promoted copper **oxidn.** **catalysts** and methods for **carbon** **monoxide** remediation)

RN 1317-38-0 HCA
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)

Cu=O

IT **1333-74-0**, Hydrogen, miscellaneous **7782-44-7**, Oxygen, miscellaneous
(platinum group metal promoted copper **oxidn.** **catalysts** and methods for **carbon** **monoxide** remediation)

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H-H

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **630-08-0**, **Carbon monoxide**, processes
(platinum group metal promoted copper **oxidn.**

catalysts and methods for **carbon**
monoxide remediation)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B031-20
NCL 423437200
CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** hydrogen purifn **carbon**
monoxide removal **catalyst**
IT **Oxidation catalysts**
Steam
(platinum group metal promoted copper **oxidn.**
catalysts and methods for **carbon**
monoxide remediation)
IT Platinum-group metals
Zeolites (synthetic), uses
(platinum group metal promoted copper **oxidn.**
catalysts and methods for **carbon**
monoxide remediation)
IT Petroleum products
Petroleum **reforming**
(**reformates**; platinum group metal promoted copper
oxidn. catalysts and methods for **carbon**
monoxide remediation)
IT 1302-88-1, Cordierite 1306-38-3, Cerium oxide, uses
1307-96-6, Cobalt oxide, uses 1313-13-9, Manganese oxide,
uses **1313-27-5**, Molybdenum oxide, uses 1313-97-9,
Neodymium oxide 1313-99-1, Nickel oxide, uses 1314-13-2, Zinc
oxide, uses 1314-23-4, Zirconia, uses 1314-62-1, Vanadium oxide,
uses 1344-28-1, Alumina, uses 7439-88-5, Iridium, uses
7440-04-2, Osmium, uses 7440-05-3, Palladium, uses 7440-06-4,
Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium,
uses **7440-50-8**, Copper, uses 7631-86-9, Silica, uses
11118-57-3, Chromium oxide 12036-32-7, Praseodymium oxide
13463-67-7, Titania, uses
(platinum group metal promoted copper **oxidn.**
catalysts and methods for **carbon**
monoxide remediation)
IT **1317-38-0**, Copper oxide (CuO), uses
(platinum group metal promoted copper **oxidn.**
catalysts and methods for **carbon**
monoxide remediation)
IT **1333-74-0**, Hydrogen, miscellaneous **7782-44-7**,
Oxygen, miscellaneous
(platinum group metal promoted copper **oxidn.**
catalysts and methods for **carbon**
monoxide remediation)
IT 64-19-7, Acetic acid, reactions 3251-23-8 39374-75-9, Platinum

hydroxide
(platinum group metal promoted copper **oxidn.** **catalysts** and methods for **carbon** **monoxide** remediation)

IT 630-08-0, **Carbon monoxide**, processes
(platinum group metal promoted copper **oxidn.** **catalysts** and methods for **carbon** **monoxide** remediation)

L51 ANSWER 9 OF 30 HCA COPYRIGHT 2003 ACS on STN

(INSTANT APP

137:188274 **Fuel cell** anode configuration for **carbon monoxide** tolerance. Uribe, Francisco A.; Zawodzinski, Thomas A. (USA). U.S. Pat. Appl. Publ. US 2002119363 A1 20020829, 11 pp., Cont.-in-part of U.S. Ser. No. 216,313, abandoned. (English). CODEN: USXXCO. APPLICATION: US 2001-848823 20010503. PRIORITY: US 1998-216313 19981218.

AB A polymer electrolyte **fuel cell** (PEFC) is designed to operate on a **reformate** fuel **stream** contg. **oxygen** and dild. hydrogen fuel with CO impurities. A **polymer electrolyte membrane** has an electrocatalytic surface formed from an electrocatalyst mixed with the polymer and bonded on an anode side of the membrane. An anode backing is formed of a porous elec. conductive material and has a first surface abutting the electrocatalytic surface and a second surface facing away from the membrane. The second surface has an **oxidn.** **catalyst** layer effective to **catalyze** the **oxidn.** of CO by oxygen present in the fuel stream where at least the layer of **oxidn.** **catalyst** is formed of a non-precious metal **oxidn.** **catalyst** selected from the group consisting of Cu, Fe, Co, Tb, W, Mo, Sn, and oxides thereof, and other metals having at least two low oxidn. states.

IT **7439-89-6**, Iron, uses **7439-98-7**, Molybdenum, uses **7440-27-9**, Terbium, uses **7440-31-5**, Tin, uses **7440-33-7**, Tungsten, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses
(**fuel cell** anode configuration for **carbon monoxide** tolerance)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

RN 7440-27-9 HCA
CN Terbium (8CI, 9CI) (CA INDEX NAME)

Tb

RN 7440-31-5 HCA
CN Tin (8CI, 9CI) (CA INDEX NAME)

Sn

RN 7440-33-7 HCA
CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0**, Hydrogen, uses
(**fuel cell** anode configuration for
carbon monoxide tolerance)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, miscellaneous
(impurity; **fuel cell** anode configuration for
carbon monoxide tolerance)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IC ICM H01M004-90
ICS H01M004-92; H01M008-10
NCL 429042000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** anode configuration **carbon**
monoxide tolerance

IT **Catalysts**
(electrocatalysts; **fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **Oxidation catalysts**
(electrochem.; **fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **Fuel cell** anodes
Solid state **fuel cells**
(**fuel cell** anode configuration for **carbon monoxide** tolerance)
IT Oxides (inorganic), uses
(**fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **Polymer electrolytes**
(**membrane**; **fuel cell** anode configuration for **carbon monoxide** tolerance)
IT Fuel gases
(**reformate**; **fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **7439-89-6**, Iron, uses **7439-98-7**, Molybdenum, uses 7440-06-4, Platinum, uses **7440-27-9**, Terbium, uses **7440-31-5**, Tin, uses **7440-33-7**, Tungsten, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses 12779-05-4
(**fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **1333-74-0**, Hydrogen, uses
(**fuel cell** anode configuration for **carbon monoxide** tolerance)
IT **630-08-0**, **Carbon monoxide**, miscellaneous
(impurity; **fuel cell** anode configuration for **carbon monoxide** tolerance)

L51 ANSWER 10 OF 30 HCA COPYRIGHT 2003 ACS on STN
137:111597 Steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst**: a kinetic analysis and strategies for suppression of CO formation. Agrell, Johan; Birgersson, Henrik; Boutonnet, Magali (Department of Chemical Engineering and Technology, KTH-Royal Institute of Technology, Chemical Technology, Stockholm, SE-100 44, Swed.). Journal of Power Sources, 106(1-2), 249-257 (English) 2002. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..
AB Steam reforming of methanol (CH3OH+H2O CO2+3H2) was studied over a com. Cu/ZnO/Al2O3 **catalyst** for prodn. of hydrogen onboard proton exchange membrane (**PEM**) **fuel cell** vehicles. A simple power-law rate expression was fitted to exptl. data to predict the rates of CO2 and **H2** formation under various reaction conditions. The apparent activation energy (Ea) was estd. to be 100.9 kJ mol-1, in good agreement with values reported in the literature. Appreciable amts. of CO byproduct were formed in the reforming process at low contact times and high methanol conversions. Being a **catalyst** poison that deactivates the electrocatalyst at the **fuel cell**

anode at concns. exceeding a few ppm, special attention was paid to the pathways for CO formation and strategies for its suppression. It was found that increasing the steam-methanol ratio effectively decreases CO formation. Likewise, addn. of oxygen or **air** to the steam-methanol mixt. minimizes the prodn. of CO. By shortening the contact time and lowering the max. temp. in the reactor, CO prodn. can be further decreased by suppressing the reverse water-gas shift reaction.

IT **7440-50-8**, Copper, uses
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **630-08-0**, **Carbon monoxide**, processes
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IT **7782-44-7**, Oxygen, uses
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST steam reforming methanol copper zinc oxide **catalyst** **fuel cell**
IT **Fuel cells**
    (proton exchange membrane; steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
IT Steam reforming
    Steam reforming **catalysts**
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
IT 1314-13-2, Zinc oxide, uses 1344-28-1, Alumina, uses **7440-50-8**, Copper, uses
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
IT **630-08-0**, **Carbon monoxide**, processes
    (steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst**

and kinetic anal. and strategies for suppression of CO formation)
IT **7782-44-7**, Oxygen, uses
(steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)
IT 67-56-1, Methanol, uses
(steam reforming of methanol over a Cu/ZnO/Al2O3 **catalyst** and kinetic anal. and strategies for suppression of CO formation)

L51 ANSWER 11 OF 30 HCA COPYRIGHT 2003 ACS on STN Bad date
136:331192 **Carbon monoxide**-selective oxidation **catalysts** showing high **catalytic** activity at low temperature and their preparation. Yonemura, Masanao; Nojima, Shigeru; Yasutake, Akinobu (Mitsubishi Heavy Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002126535 A2 20020508, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-329999 20001030.
AB The oxidn. **catalysts** capable of selectively oxidizing **CO** in mixed **gases** contg. **CO**, **H2**, and an oxidizing agent of **O2** in PROx (preferential CO oxidn.) devices of polymer electrolyte **fuel cells** (PEFC), are prepd. by adding **catalyst** supports in solvents, followed with adding **catalyst** active components in the solvents. Preferably, the supports are zeolites and in the above-mentioned solvent reaction, alkali metals or H of the zeolites are ion-exchanged with metals of metal salts (**catalyst** active components). The zeolites may be cryst. silicates, Y-type zeolites, A-type zeolites, .beta.-type zeolites, mordenite, and/or ferrierite. The cryst. silicates may be shown as (1 .+-. 0.8)R2O.[aM2O3.bLO.cAl2O3].ySiO2 [R = alkali metal and/or H; M = Group VIII element, rare earth element, Ti, V, Cr, Nb, Sb, and/or Ga; L = Mg, Ca, Sr, and/or Ba; a .gtoreq.0, b = 0-20, a + b = 1, y = 11-3000; having the highest to the 5th highest peaks in the powder X-ray diffraction using CuK.alpha. ray in the lattice spacing of 3.65 .+-. 0.1, 3.75 .+-. 0.1, 3.85 .+-. 0.1, 10.0 .+-. 0.3, and 11.2 .+-. 0.3 .ANG.]. The metal salts may be nitrates, sulfates, chlorides, acetates, or hydroxides of Pt, Ru, Pd, Rh, Ir, Cr, Co, Ni, Cu, Fe, and/or Sn.
IT **7782-44-7**, Oxygen, uses
(oxidizing agent; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **7440-31-5**, Tin, uses
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
RN 7440-31-5 HCA
CN Tin (8CI, 9CI) (CA INDEX NAME)

Sn

IT 630-08-0, **Carbon monoxide**, reactions
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IT **1333-74-0**, Hydrogen, uses
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IC ICM B01J029-70
ICS B01J029-12; B01J029-22; B01J029-67; B01J029-74; B01J029-76; B01J029-78; C10K001-34; H01M008-06; H01M008-10; C01B003-32
CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 49, 51
ST **carbon monoxide** selective oxidn **catalyst** prepn; hydrogen fuel prepn **carbon monoxide** oxidn removal; zeolite support **carbon monoxide** selective oxidn **catalyst**; preferential **carbon monoxide** oxidn **catalyst** prepn
IT A zeolites
Beta zeolites
Y zeolites
(**catalyst** support; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
IT Silicates, uses
(cryst., **catalyst** support; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
IT **Fuel cells**
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
IT Oxidation **catalysts**
(selective; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
IT 124-38-9P, Carbon dioxide, **processes**
(**CO** removal as; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)
IT 12173-30-7, Ferrierite 12173-98-7, Mordenite

(**catalyst** support; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT 353275-99-7P, Aluminum calcium iron silicon oxide ($Al_{1.6}Ca_{0.2}Fe_{0.5}Si_{27}O_{57.35}$)
(**catalyst** support; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT **7782-44-7**, Oxygen, uses
(oxidizing agent; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT 7439-88-5, Iridium, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses **7440-31-5**, Tin, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT **630-08-0**, **Carbon monoxide**, reactions
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT **1333-74-0**, Hydrogen, uses
(prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

IT 7440-06-4, Platinum, uses
(supported on zeolites; prepn. of CO-selective oxidn. **catalysts** supported on zeolites for H fuel prepn.)

L51 ANSWER 12 OF 30 HCA COPYRIGHT 2003 ACS on STN MD

136:297210 Process for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation. Dieckmann, Gunther H.; Moir, Michael E. (Chevron U.S.A. Inc., USA). PCT Int. Appl. WO 2002028770 A1 20020411, 19 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US30924 20010927. PRIORITY: US 2000-PV237298 20001002.

AB A process to suppress the formation of coke during processing of a hydrocarbonaceous material, such as a hydrocarbon conversion processes. Electromagnetic radiation is applied to the hydrocarbonaceous material while the material is heated to >700 degrees F. The frequency of the electromagnetic radiation is preferably <300 MHz. The process is particularly useful in the **reforming** of a hydrocarbon for conversion in a **fuel cell**.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses
(process for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **630-08-0P**, **Carbon monoxide**, preparation
1333-74-0P, **Hydrogen**, preparation
(**process** for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, **Oxygen**, reactions
(**process** for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IC ICM C01B003-24
CC 51-6 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 67
ST hydrocarbon **reforming** coke **catalyst** RF radiation heating **fuel cell**
IT **Air**
Fuel cells
Heating
Perovskite-type crystals
Radio wave
Steam **reforming** kinetics
(process for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)

IT Fuel gas manufacturing
(**reforming**; process for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)
IT 7439-88-5, Iridium, uses **7439-89-6**, Iron, uses 7439-96-5, Manganese, uses 7440-02-0, Nickel, uses 7440-04-2, Osmium, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses **7440-48-4**, Cobalt, uses 7440-50-8, Copper, uses
(process for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)
IT 74-82-8P, Methane, preparation 124-38-9P, Carbon dioxide, preparation **630-08-0P**, **Carbon monoxide**
, preparation **1333-74-0P**, **Hydrogen**, preparation
(**process** for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)
IT 71-43-2, Benzene, reactions 108-88-3, Toluene, reactions 110-54-3, Hexane, reactions 7732-18-5, Water, reactions **7782-44-7**, **Oxygen**, reactions
(**process** for reducing coke formation in hydrocarbon processing by application of radio frequency electromagnetic radiation)

L51 ANSWER 13 OF 30 HCA COPYRIGHT 2003 ACS on STN Bud lese
135:154730 Method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**..
Echigo, Mitsuaki; Suzuki, Minoru; Okada, Osamu (Osaka Gas Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001220108 A2 20010814, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-33494 20000210.
AB In title method for removing CO from CO-contg. **H**-rich object **gas** to be processed, an oxidant is added to the object gas, and a mainly Cu-contg. CO-removing **catalyst** is used for removal of CO by oxidn. reaction at 100-400.degree.. The mainly Cu-contg. CO-removing **catalyst** may contg. W or Mo at at. ratio Cu : W or Cu : Mo = 1 : 0.002-0.2. The mainly Cu-contg. CO-removing **catalyst** is obtained by firing CuO powder. The CO-contg. **H**-rich object **gas** can be hydrocarbon-reformed gas for **fuel cell**.
IT **7439-98-7D**, Molybdenum, compd., uses **7440-33-7D**, Tungsten, compd., uses
(**catalyst** contg.; method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)
RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

RN 7440-33-7 HCA
CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

IT 1333-74-0P, Hydrogen, preparation
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, reactions
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **630-08-0**, **Carbon monoxide**, processes
(removal of; method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^-C\equiv O^+$

IC ICM C01B003-38
ICS B01J023-72; B01J023-85; B01J023-88; C10K003-04
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52, 67
ST **hydrogen** rich **gas carbon monoxide** removal; **catalyst carbon monoxide** removal gas; cupric oxide **catalyst carbon monoxide** removal; hydrocarbon reformed gas **carbon monoxide** removal; **fuel cell** hydrocarbon **carbon monoxide** removal
IT **Fuel cells**
(**fuel** for; method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas** for)
IT **Catalysts**
Oxidizing agents
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)
IT Hydrocarbons, reactions
(reforming of; method and **catalyst** for removal of

carbon monoxide from **hydrogen**-rich **gas**)

IT 1317-38-0, Cupric oxide, uses **7439-98-7D**, Molybdenum, compd., uses **7440-33-7D**, Tungsten, compd., uses 7440-50-8D, Copper, compd., uses 10213-10-2
(**catalyst** contg.; method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)

IT **1333-74-0P**, Hydrogen, preparation
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)

IT **7782-44-7**, Oxygen, reactions
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)

IT 1314-13-2, Zinc oxide (ZnO), uses 1344-28-1, Alumina, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
(method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas** for)

IT **630-08-0**, **Carbon monoxide**, processes
(removal of; method and **catalyst** for removal of **carbon monoxide** from **hydrogen**-rich **gas**)

~~questionable date~~ bad date (decl.)

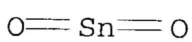
L51 ANSWER 14 OF 30 HCA

135:109578 Synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen. Iyuke, S. E. (Department of Chemical & Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia, Selangor, Malay.). Chemical Engineering Research and Design, 79(A2), 209-214 (English) 2001. CODEN: CERDEE. ISSN: 0263-8762. Publisher: Institution of Chemical Engineers.

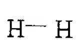
AB In an attempt to produce hydrogen for a less relatively expensive proton exchange membrane (**PEM**) **fuel cell** than the present expensive means, the steam reformation of methane was proposed because a steam reformer is a cheap source of hydrogen compared to water electrolysis and other methods. However, the reformer effluent contains about 75% hydrogen and 25% **carbon monoxide** (CO) by vol. Reformation with a good **catalyst** could yield a 1% CO content in the effluent, but 1% CO, which is equiv. to 10,000 ppm CO, has a poisoning effect on the platinum (Pt) **catalysts** of the **PEM fuel cell** electrodes. Since the **catalyst** can only tolerate CO of less than 100 ppm, it is then expedient to introduce a purifn. system to reduce the CO content to the required concn. To achieve this, activated carbon (AC)-SnO2 adsorbent was synthesized and used in a pressure swing adsorption (PSA) system. Consequently, 34.57% SnCl2.2H2O salt as a tin ion precursor, was impregnated onto activated carbon to improve its adsorptive interaction with CO. A model **H2**/CO mixt., representing the stoichiometric ratio of **H2** and CO in the steam reformer effluent gas was used. It was obsd. that the amt. of CO adsorbed was almost equal to that desorbed, which implies that the adsorption of CO on the prepd.

adsorbents is reversible. Further exploitation of the impregnated activated carbon in PSA expts. showed that adsorption of **carbon monoxide** was higher with the impregnated carbon than in the pure carbon. Within the limits of anal. error, it was seen that the concn. of **carbon monoxide**, which was 1000 ppm, was successfully reduced to 40.2 and 10.4 ppm by the pure and the impregnated activated carbons, resp. These results confirmed that Sn-activated carbon in the PSA system could be used in the purifn. of hydrogen. The species responsible for the improved **gas** phase **CO** adsorption with the impregnated carbon was found to be SnO2. Consequently, the high adsorptive selectivity of AC-SnO2 towards **gas** phase **CO**, when compared to that of the pure carbon, confirms its superiority and applicability in the removal of CO. This phenomenon then indicates a good future for the robustness of this promising adsorbent, since CO remains a major contributor to the current level of the global **air** pollution problems.

IT **18282-10-5**, Tin dioxide
(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)
RN 18282-10-5 HCA
CN Tin oxide (SnO2) (8CI, 9CI) (CA INDEX NAME)



IT **1333-74-0**, **Hydrogen**, **processes**
(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, processes
(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48, 49
ST hydrogen proton exchange membrane **fuel cell**; activated carbon tin dioxide swing adsorption
IT Solid state **fuel cells**
(proton exchange membrane; synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)
IT **18282-10-5**, Tin dioxide

(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)

IT **1333-74-0**, **Hydrogen**, **processes**
(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)

IT **630-08-0**, **Carbon monoxide**, processes
(synthesized tin-activated carbon adsorbent for purer and cheaper hydrogen)

L51 ANSWER 15 OF 30 HCA COPYRIGHT 2003 ACS on STN Bad date
135:94667 Method for decreasing **carbon monoxide** content in **hydrogen**-containing **gas** and **catalyst** thereof.. Hiramatsu, Yasushi (Mitsubishi Gas Chemical Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001199706 A2 20010724, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-8927 20000118.

AB The title method includes contacting **H**-contg. **gas** contained **CO** with **O2** in the presence of Fe- and Pt-coexisting **catalysts**. The **H**-contg. **gas** contained **CO** is contacted with 0.5- to 4-fold **O2** at 20-120.degree.. The Fe- and Pt-contg. components are supported on a support. The **H**-contg. **gas** is manufd. by **reforming** reaction of hydrocarbons or methane to serve as H source of **fuel cell**, etc.

IT **7439-89-6**, Iron, uses
(**catalyst** contg.; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

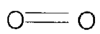
IT **1333-74-0P**, Hydrogen, preparation
(method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, reactions
(method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, processes
(removal of; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

IC ICM C01B003-38
ICS B01J023-89; C10K003-04; H01M008-06
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 51, 52, 67
ST **carbon monoxide** content decrease **catalytic** oxidn; **hydrogen gas** **carbon monoxide** content decrease; **reforming carbon monoxide** content decrease oxidn; **fuel cell** hydrogen **carbon monoxide** removal
IT **Fuel cells**
(**fuel** for; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT Hydrocarbons, reactions
(**reforming** of; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT **7439-89-6**, Iron, uses 7440-06-4, Platinum, uses
(**catalyst** contg.; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT **1333-74-0P**, Hydrogen, preparation
(method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT **7782-44-7**, Oxygen, reactions
(method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT 67-56-1, Methanol, reactions
(**reforming** of; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)
IT **630-08-0**, **Carbon monoxide**, processes
(removal of; method for decreasing **carbon monoxide** content in **hydrogen**-contg. **gas** and **catalyst** thereof)

Bad date

L51 ANSWER 16 OF 30 HCA COPYRIGHT 2003 ACS on STN
135:63327 Selective partial oxidation reactor for production of hydrogen by hydrocarbon **reforming**.. Matsui, Nobuki; Ikegami, Shuji; Okamoto, Yasunori (Daikin Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001180910 A2 20010703, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-373589 19991228.

AB The title app. includes gas path(s) for partial oxidn. of introduced **gas** to remove **CO** by combustion reaction in the presence of oxidn. **catalyst** in **H2** atm., and a heat exchanger for heat exchanging between introduced gas in the gas path(s) and a heat-transfer medium in a heat-transfer medium path; the oxidn. **catalyst** is arranged on the heat exchanger. The heat exchanger includes Al heat-transfer fins. **Catalyst** films are coated on Al oxidn.-generated Al2O3 layers on the surfaces of the heat exchanger. The **catalyst** can be Ru-, Pt-, Rh-, Au- or Co-based **catalyst**. The heat-transfer medium is **air**. The app. can be used for **fuel cell** system, and water is used for recovery of waste heat from the **fuel cell** system.

IT **7440-48-4**, Cobalt, uses
(**catalyst** contg.; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0P**, Hydrogen, preparation
(prodn. of; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IC ICM C01B003-38
ICS H01M008-06
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST selective partial oxidn reactor hydrogen prodn; hydrocarbon

reforming hydrogen prodn oxidn reactor; **fuel cell** hydrogen prodn oxidn reactor
IT **Air**
(heat-transfer medium; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT **Reforming**
(of hydrocarbon; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT Oxidation
(partial; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT Waste heat
(recovery of; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT Hydrocarbons, reactions
(**reforming** of; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT Combustion
Fuel cells
Heat exchangers
Heat transfer
Oxidation **catalysts**
Reactors
(selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses **7440-48-4**, Cobalt, uses 7440-57-5, Gold, uses
(**catalyst** contg.; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT **1333-74-0P**, Hydrogen, preparation
(prodn. of; selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT 7429-90-5, Aluminum, uses
(selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT 7732-18-5, Water, uses
(selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)
IT **630-08-0**, **Carbon monoxide**, reactions
(selective partial oxidn. reactor for prodn. of hydrogen by hydrocarbon **reforming**)

L51 ANSWER 17 OF 30 HCA

~~Questionable date~~ bad date (decl.)

135:48609 Process for reducing concentration of **carbon monoxide** in **hydrogen**-containing **gas** using **catalyst**. Takamura, Koki; Hiramatsu, Yasushi (Mitsubishi Gas Chemical Company, Inc., Japan). U.S. Pat. Appl. Publ. US 2001004453 A1 20010621, 22 pp. (English). CODEN: USXXCO. APPLICATION: US 2000-734888 20001213. PRIORITY: JP 1999-363370 19991221; JP 2000-8928 20000118; JP 2000-33523 20000210; JP 2000-127553 20000427.

AB There are disclosed a process for effectively reducing a **carbon monoxide** concn. in a **hydrogen** -contg. **gas** obtained by **reforming** methanol or the like, and a **catalyst** used therefore. In the present invention, **carbon monoxide** in the **hydrogen**-contg. **gas** is contacted with oxygen in the presence of a **catalyst** comprising platinum and at least one metal selected from the group consisting of cobalt, nickel, copper and manganese.

IT **7440-48-4**, Cobalt, uses
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **1333-74-0P**, **Hydrogen**, uses
(**process** for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, **Oxygen**, reactions
(**process** for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **630-08-0**, **Carbon monoxide**, processes
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^-C\equiv O^+$

IC ICM B01J023-42
ICS B01J023-40

NCL 423247000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST **fuel cell** hydrogen **carbon monoxide** lowering **catalyst**
IT **Fuel cells**
Oxidation
Oxidation **catalysts**
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)
IT 1344-28-1, Alumina, uses 7429-90-5, Aluminum, uses 7439-96-5, Manganese, uses 7440-02-0, Nickel, uses 7440-06-4, Platinum, uses **7440-48-4**, Cobalt, uses 7440-50-8, Copper, uses 7440-66-6, Zinc, uses
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)
IT **1333-74-0P**, **Hydrogen**, uses
(**process** for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)
IT **7782-44-7**, **Oxygen**, reactions
(**process** for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)
IT **630-08-0**, **Carbon monoxide**, processes
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)
IT 497-19-8, Sodium carbonate, uses 1310-73-2, Sodium hydroxide, uses
(process for reducing concn. of **carbon monoxide** in **hydrogen**-contg. **gas** using **catalyst**)

L51 ANSWER 18 OF 30 HCA COPYRIGHT 2003 ACS on STN Bad date
135:7811 Manufacture of **hydrogen**-containing **gas** for **fuel cells**. Fukunaga, Tetsuya; Takatsu, Kozo; Kisen, Tadashi (Idemitsu Kosan Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001155755 A2 20010608, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-335625 19991126.
AB **H**-contg. **gas** is manufd. by selective oxidn. removal of CO followed by contacting with **O2**-removing **catalysts** for control of **O2** concn. to .ltoreq.500 ppm. The **O2**-removing **catalysts** may be Pt, Cr, Mo, W, Mn, V, Fe, Co, Ni, Cu, Ru, Rh, Ir, Ag, Au, and/or Pd and their supports may contain Al2O3, TiO2, ZrO2, SiO2, and/or C. Oxidn. of H on Pt anodes are prevented by using **H** fuel **gas** of decreased **O** concn.
IT **7439-98-7**, Molybdenum, uses **7440-33-7**, Tungsten, uses
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and

catalytic O removal)
RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

RN 7440-33-7 HCA
CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

IT **630-08-0**, **Carbon monoxide, processes**
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IT **1333-74-0P**, Hydrogen, preparation
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, **Oxygen, processes**
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IC ICM H01M008-06
ICS B01J023-42; B01J023-58; C01B003-38
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **oxygen** removal **hydrogen gas**
fuel cell; **catalytic** oxygen removal
hydrogen fuel **gas**; carbon oxide oxidative removal
hydrogen fuel
IT **Fuel cells**

Oxidation
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT Alkali metals, uses
Alkaline earth metals
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT Fuel **gas** manufacturing
(purifn., **hydrogen**; manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT 1314-23-4, Zirconium oxide (ZrO2), uses 1344-28-1, Cataloid AP, uses 7440-44-0, Carbon, uses 7631-86-9, Silicon oxide (SiO2), uses 13463-67-7, Tipaque CR-EL, uses
(**catalyst** support; manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT 7439-88-5, Iridium, uses 7439-89-6, Iron, uses 7439-96-5, Manganese, uses **7439-98-7**, Molybdenum, uses 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-09-7, Potassium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-22-4, Silver, uses **7440-33-7**, Tungsten, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 7440-62-2, Vanadium, uses
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT **630-08-0**, **Carbon monoxide**, **processes**
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT **1333-74-0P**, Hydrogen, preparation
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

IT **7782-44-7**, **Oxygen**, **processes**
(manuf. of **hydrogen**-contg. **gas** for **fuel cells** by oxidative CO removal and **catalytic** O removal)

wo

L51 ANSWER 19 OF 30 HCA COPYRIGHT 2003 ACS on STN
134:225083 Hybrid **fuel-cell** electric-combustion power system using complete pyrolysis. Manikowski, Ambrose F.; Noland, Gary M. (Procyon Power Systems, Inc., USA). PCT Int. Appl. WO 2001020703 A1 20010322, 36 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG,

MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US25267 20000913. PRIORITY: US 1999-396827 19990914.

AB This is a procedure for producing mech. power and a hybrid power generation unit for practising such a process. In particular, the procedure uses a thermal or **catalytic** cracker to crack or to pyrolyze (partially or completely) a liq. or gaseous petroleum fuel to produce a primary gaseous **stream** primarily contg. **hydrogen** (and likely methane or other short-chain hydrocarbons). The hydrogen may be used in a **fuel cell** to produce electricity, which electricity is used in a linear or rotary elec. motor. In the preferred procedure, the residuum of the pyrolyzed feedstock is laid down in the reactor. A regeneration step is used to remove that residuum and produce a **carbon monoxide**-rich gas which then may be introduced to an internal or external combustion engine for further prodn. of mech. power. Most preferred of the combustion engines is one having high thermal efficiency. This combination of pyrolysis, **fuel cell**, and high efficiency heat engine results in a procedure and device which is significantly more efficient in terms of utilizing the energy present in the feedstock hydrocarbon fuel. Addnl., under high temp. operation when the fuel to the engine is a **carbon monoxide**-rich gas, the emissions from the system will be substantially lower than for conventional power systems. Finally, when some portion of the process heat required by the pyrolysis and de-coking operations is obtained from waste heat from the engine, an increase in the total thermal content of the fuel can be realized, further increasing the overall fuel economy of the hybrid system.

IT **7439-98-7**, Molybdenum, uses **7440-27-9**, Terbium, uses **7440-33-7**, Tungsten, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)

RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

RN 7440-27-9 HCA
CN Terbium (8CI, 9CI) (CA INDEX NAME)

Tb

RN 7440-33-7 HCA
CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

IT **630-08-0P**, **Carbon monoxide**, uses
1333-74-0P, Hydrogen, uses
(hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, uses
(hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IC ICM H01M008-06
ICS B60K006-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48, 51, 59
ST **fuel cell** elec combustion power system hybrid
IT Engines
(Atkinson cycle; hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
IT Internal combustion engines
(Otto; hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
IT Power
(generation; hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
IT Engines
(heat; hybrid **fuel**-**cell** elec.-combustion power system using complete pyrolysis)
IT Combustion engines
Cracking **catalysts**
Diesel engines
Fuel cells
Fuel gas manufacturing
Internal combustion engines

Thermal decomposition
Thermal decomposition **catalysts**
Turbines
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT Rare earth metals, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT Hydrocarbons, uses
Petroleum, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT Power
(plants; hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT Waste heat
(use; hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT 1308-38-9, Chromic oxide, uses 7429-91-6, Dysprosium, uses 7439-88-5, Iridium, uses 7439-89-6, Iron, uses 7439-94-3, Lutetium, uses 7439-96-5, Manganese, uses **7439-98-7**, Molybdenum, uses 7440-00-8, Neodymium, uses 7440-02-0, Nickel, uses 7440-03-1, Niobium, uses 7440-04-2, Osmium, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-10-0, Praseodymium, uses 7440-12-2, Promethium, uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-19-9, Samarium, uses 7440-25-7, Tantalum, uses 7440-26-8, Technetium, uses **7440-27-9**, Terbium, uses 7440-30-4, Thulium, uses 7440-32-6, Titanium, uses **7440-33-7**, Tungsten, uses 7440-45-1, Cerium, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7440-52-0, Erbium, uses 7440-53-1, Europium, uses 7440-54-2, Gadolinium, uses 7440-58-6, Hafnium, uses 7440-60-0, Holmium, uses 7440-62-2, Vanadium, uses 7440-64-4, Ytterbium, uses 7440-67-7, Zirconium, uses 7440-74-6, Indium, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT 1344-28-1, Alumina, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT 124-38-9, Carbon dioxide, formation (nonpreparative)
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT 74-82-8, Methane, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT **630-08-0P**, **Carbon monoxide**, uses
1333-74-0P, Hydrogen, uses
(hybrid **fuel-cell** elec.-combustion power system using complete pyrolysis)
IT 67-56-1, Methanol, uses 7732-18-5, Water, uses **7782-44-7**
, Oxygen, uses

(hybrid **fuel-cell** elec.-combustion power
system using complete pyrolysis)

No - Pt/Mo

L51 ANSWER 20 OF 30 HCA COPYRIGHT 2003 ACS on STN
134:44440 High energy ball-milled Pt-Mo **catalysts** for polymer electrolyte **fuel cells** and their tolerance to CO. Gouerec, P.; Denis, M. C.; Guay, D.; Dodelet, J. P.; Schulz, R. (INRS-Energie et Materiaux, Varennes, QC, J3X 1S2, Can.). Journal of the Electrochemical Society, 147(11), 3989-3996 (English) 2000. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.

AB **Catalysts** contg. Pt and Mo were synthesized by high energy ballmilling. The two metal powders were milled together in one step with a leachable dispersing agent (Al or MgH_2) and a leachable process-control agent (NaF or MgH_2) to increase the specific area of the **catalysts** and avoid sticking of the **catalyst**'s precursor on the vial walls and grinding balls. The **catalysts** were labeled $Pt_{0.5}Mo_{0.5}(Al)_4$ and $Pt_{0.5}Mo_{0.5}(MgH_2)_4$ to reflect the bulk at. or mol. nominal content of the milled powders. After the leaching step, the actual bulk Mo content of both **catalysts** was rather low (.apprx.5 at.%). Despite their low Mo content, both **catalysts** displayed a similar performance, in **H2** + 100 ppm CO/**O2** **fuel cell** tests, to that displayed by $Pt_{0.5}Ru_{0.5}$ black from Johnson Matthey. The best **catalyst** in **H2** + 100 ppm CO was $Pt_{0.5}Mo_{0.5}(MgH_2)_4$, which is a face-centered cubic solid soln. of Mo (.apprx.5 at.%) in Pt with a specific area of 35.9 m^2/g. By combining X-ray diffraction, XPS, and **fuel cell** test results, it was possible to det. that Pt was metallic in the **catalyst**, but that Mo(V and VI) were present at the surface of the working anode in **H2** + 100 ppm CO.

IT **7439-98-7**, Molybdenum, uses
(high energy ball-milled Pt-Mo **catalysts** for polymer electrolyte **fuel cells** and their tolerance to CO)

RN 7439-98-7 HCA

CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67, 72

ST ball milled platinum molybdenum alloy **catalyst**; polymer electrolyte **fuel cell catalyst**; **carbon monoxide** tolerance **catalyst** **fuel cell**

IT Ball milling
Catalysts
Fuel cell anodes
Fuel cells
Mechanical alloying

(high energy ball-milled Pt-Mo **catalysts** for polymer electrolyte **fuel cells** and their tolerance to CO)

IT **7439-98-7**, Molybdenum, uses 7440-06-4, Platinum, uses
(high energy ball-milled Pt-Mo **catalysts** for polymer electrolyte **fuel cells** and their tolerance to CO)

L51 ANSWER 21 OF 30 HCA COPYRIGHT 2003 ACS on STN

134:19381 Water-gas shift reactor warm-up in **PEM fuel cell** system. Yu, Taichiang P.; Schoeneweiss, Michael R. (General Motors Corp., USA). Eur. Pat. Appl. EP 1058328 A2 20001206, 8 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-109369 20000502. PRIORITY: US 1999-323465 19990601.

AB Shortening the warm-up time of a water-gas-shift reactor is attained by **injecting oxygen** throughout its **catalyst** bed as the reactor is heating up. The oxygen reacts exothermically with CO in the input gas to the reactor to generate heat that supplements the external heat put into the reactor.

IT **7440-50-8**, Copper, uses
(water-gas shift reactor warm-up in **PEM fuel cell** system)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, **Hydrogen**, uses
(water-**gas** shift reactor warm-up in **PEM fuel cell** system)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(water-gas shift reactor warm-up in **PEM fuel cell** system)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IT **7782-44-7**, **Oxygen**, uses
(water-**gas** shift reactor warm-up in **PEM fuel cell** system)

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IC ICM H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** system water gas shift reactor warmup
IT **Fuel cells**
Water gas shift reaction
Water gas shift reaction **catalysts**
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT Gasoline
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT Hydrocarbons, uses
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT 1314-13-2, Zinc oxide zno, uses 1332-37-2, Iron oxide, uses **7440-50-8**, Copper, uses 11118-57-3, Chromium oxide
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT **1333-74-0P**, **Hydrogen**, uses
(water-**gas** shift reactor warm-up in **PEM fuel cell** system)
IT 67-56-1, Methanol, reactions
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT **630-08-0**, **Carbon monoxide**, reactions
(water-gas shift reactor warm-up in **PEM fuel cell** system)
IT **7782-44-7**, **Oxygen**, uses
(water-**gas** shift reactor warm-up in **PEM fuel cell** system)

No-Pt + other shift

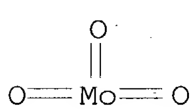
L51 ANSWER 22 OF 30 HCA COPYRIGHT 2003 ACS on STN
133:225487 Pt-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**. Lalande, G.; Denis, M. C.; Gouerec, P.; Guay, D.; Dodelet, J. P.; Schulz, R. (IREQ, Hydro-Quebec, Varennes, QC, J3X-1S1, Can.). Journal of New Materials for Electrochemical Systems, 3(3), 185-192 (English) 2000. CODEN: JMESFQ. ISSN: 1480-2422. Publisher: Journal of New Materials for Electrochemical Systems.

AB Ball milling of Pt powder with powders of WO_2, WO_3, MoO_2 or MoO_3 has been performed to synthesize CO-tolerant nanocomposite anode electrocatalysts for **polymer electrolyte membrane fuel cells**. In order to increase the sp. surface area of the final products and to prevent sticking during milling, MgH_2 was added to the powders as a

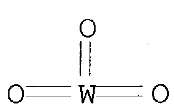
dispersing agent. After milling, MgH2 was leached away in 1M HCI (lixiviation step). The sp. surface areas of the new **catalysts** range from 12.4 to 33.5 m2/g. X-ray diffraction indicates that WOx-based **catalysts** are true nanocomposites while MoOx-based systems display only the Pt structure. **Catalysts** obtained by milling Pt+WO3 are made of Pt nanocrystals and crystallites of WO3.bul.H2O, H0.12WO3.bul.2H2O and H2WO4.bul.H2O, while **catalysts** obtained by milling Pt+WO2 are made of Pt nanocrystals and crystallites of WO3 and WO3.bul.H2O. For the Pt+MoOx systems, the ball milled Mo oxides decomp. into Mo-based species and are leached away during the lixiviation step. XPS of Pt+MoOx indicates that some Mo remains in these **catalysts** and that it is in solid soln. into the Pt structure. In **fuel cell** tests with **H2** + 100 ppm CO at the anode and **O2** at the cathode, Pt+WOx **catalysts** and com. PtRu black display comparable CO-tolerance while Pt+MoOx powders exhibit lower performances. Pt+WO3 **catalysts** lack, however, long term stability, their c.d. at 0.5 V decreasing at about 3%/100 h.

IT **1313-27-5**, Molybdena, uses **1314-35-8**, Tungsten trioxide, uses **12036-22-5**, Tungsten dioxide **18868-43-4**, Molybdenum dioxide
(platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)

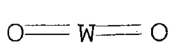
RN 1313-27-5 HCA
CN Molybdenum oxide (MoO3) (7CI, 8CI, 9CI) (CA INDEX NAME)



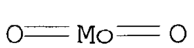
RN 1314-35-8 HCA
CN Tungsten oxide (WO3) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 12036-22-5 HCA
CN Tungsten oxide (WO2) (6CI, 8CI, 9CI) (CA INDEX NAME)



RN 18868-43-4 HCA
CN Molybdenum oxide (MoO2) (8CI, 9CI) (CA INDEX NAME)



IT 630-08-0, **Carbon monoxide**, miscellaneous
(platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67, 72
ST ball milling platinum powder anode **catalyst**; anode electrocatalyst **carbon monoxide** tolerant; polymer electrolyte **fuel cell** anode **catalyst**
IT **Oxidation catalysts**
(electrochem.; platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)
IT Ball milling
Fuel cell anodes
(platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)
IT **1313-27-5**, Molybdena, uses **1314-35-8**, Tungsten trioxide, uses 7440-06-4, Platinum, uses **12036-22-5**, Tungsten dioxide **18868-43-4**, Molybdenum dioxide
(platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)
IT **630-08-0**, **Carbon monoxide**, miscellaneous
(platinum-based nanocomposites produced by high energy ball milling as electrocatalysts in polymer electrolyte **fuel cells**)

L51 ANSWER 23 OF 30 HCA COPYRIGHT 2003 ACS on STN No - Au/Fe_2O_3
132:154457 Method for the production of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**. Plzak, Vojtech (Zentrum fur Sonnenenergie- und Wasserstoff-Forschung Baden-Wurttemberg, Germany). PCT Int. Appl. WO 2000009259 A2 20000224, 14 pp. DESIGNATED STATES: W: CA, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (German). CODEN: PIXXD2. APPLICATION: WO 1999-DE2528 19990811. PRIORITY: DE 1998-19836585 19980812.
AB The invention relates to an Au/Fe2O3 **catalyst** material comprised of a particle-shaped, co-**catalytically** active Fe2O3 supporting material with metallic Au clusters deposited thereupon which have a diam. of less than 4.5 nm. The **catalyst** materials can be obtained by: (a) reacting a

water-sol. Fe(III) salt in an aq. medium with a base; (b) impregnating the hydroxide gel which is formed thereby and which is still moist with a soln. of a water-sol. Au compd. in order to deposit complexed Au clusters on the surface of the hydroxide gel; (c) removing water from the suspension of the reaction product formed thereby; and (d) subjecting the dried reaction product to a calcination at temps. ranging from 350 to 700.degree.. The inventive **catalyst** material is esp. suited for selective low-temp. CO oxidn. in **reformate** hydrogen which is used as combustible gas for **polymer electrolyte membrane fuel cells**.

IT **1309-37-1**, Ferric oxide, uses
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

RN 1309-37-1 HCA

CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IT **1333-74-0P**, Hydrogen, uses
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM B01J023-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 59, 67

ST **fuel cell** gold iron oxide **catalyst**

IT **Air** purification
(**catalytic oxidn.**; method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT **Fuel cells**
Oxidation catalysts
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT Carbonates, reactions
Hydroxides (inorganic)
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT Hydrocarbons, reactions
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT **1309-37-1**, Ferric oxide, uses 7440-57-5, Gold, uses
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT **1333-74-0P**, Hydrogen, uses
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT **630-08-0**, **Carbon monoxide**, reactions
10377-60-3, Magnesium nitrate 10421-48-4, Ferric nitrate
16903-35-8, Tetrachloroauric acid
(method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

IT 1308-38-9, Chromia, uses 1309-48-4, Magnesia, uses 1344-28-1, Alumina, uses
(sintering inhibitor; method for prodn. of Au/Fe2O3 **catalyst** materials and their use in **polymer electrolyte membrane fuel cells**)

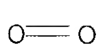
No

L51 ANSWER 24 OF 30 HCA COPYRIGHT 2003 ACS on STN
132:99526 Method of screening compositions for electrocatalytic activity. Mallouk, Thomas E.; Smotkin, Eugene; Reddington, Erik; Sapienza, Anthony (The Penn State Research Foundation, USA). PCT Int. Appl. WO 2000004362 A2 20000127, 34 pp. DESIGNATED STATES: W: CA, DE, JP. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US12520 19990604. PRIORITY: US 1998-88294 19980605.

AB Methods for identifying compns. useful for **catalyzing** electrochem. reactions are described. The methods involve simultaneously screening a large no. of compns. for electrocatalytic activity using a single voltage source.

IT **7782-44-7**, Oxygen, properties
(screening compns. for electrocatalytic activity by measuring of potential-current relationship in gas diffusion electrolytic cell with methanol-water soln.)

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **7439-98-7**, Molybdenum, uses

(screening compns. for electrocatalytic activity contg.)
RN 7439-98-7 HCA
CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

IT **630-08-0**, **Carbon monoxide**, properties
1333-74-0, Hydrogen, properties
(use in gas diffusion cell for screening compns. for
electrocatalytic activity)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IC ICM G01N
CC 72-2 (Electrochemistry)
Section cross-reference(s): 67
IT **Catalysts**
(electrocatalysts; screening compns. for electrocatalytic
activity for reactions in batteries and **fuel
cells**)
IT Oxidation, electrochemical
(ofhydrogen and **carbon monoxide**, in screening
compns. for electrocatalytic activity)
IT Electric screening
(screening compns. for electrocatalytic activity for reactions in
batteries and **fuel cells**)
IT **7782-44-7**, Oxygen, properties
(screening compns. for electrocatalytic activity by measuring of
potential-current relationship in gas diffusion electrolytic cell
with methanol-water soln.)
IT 7439-88-5, Iridium, uses **7439-98-7**, Molybdenum, uses
7440-04-2, Osmium, uses 7440-06-4, Platinum, uses 7440-16-6,
Rhodium, uses 7440-18-8, Ruthenium, uses
(screening compns. for electrocatalytic activity contg.)
IT **630-08-0**, **Carbon monoxide**, properties
1333-74-0, Hydrogen, properties
(use in gas diffusion cell for screening compns. for
electrocatalytic activity)

no

L51 ANSWER 25 OF 30 HCA COPYRIGHT 2003 ACS on STN
132:37936 Autothermal combustion systems for fuels conversion and
reforming. Cole, Jerald A. (Energy and Environmental Research

Corporation, USA). U.S. US 6007699 A 19991228, 18 pp. (English). CODEN: USXXAM. APPLICATION: US 1996-700838 19960821.

AB Fuel is oxidized and the heat is transferred for further use in an autothermal combustion and reforming system. A bed is forming of an unmixed combustion **catalyst**, which in an oxidized state is readily reducible and in a reduced state is readily oxidizable, and placed in efficient thermal contact with a heat receiver for use in the combustion system. Fuel and **air** are alternately contacted with the bed, so that fuel is oxidized, the **air** is depleted of oxygen, and heat is liberated. The heat is efficiently transferred to the heat receiver by careful selection of the materials of the bed such that the temps. produced when the fuel is oxidized and when the **air** is depleted of oxygen are advantageous to the particular use in the combustion system. The system can be used with steam reforming app., e.g., for low-sulfur **H2** generation for **fuel cells**, or with turbine based power generators.

IT **7440-31-5**, Tin, uses
(autothermal combustion system for steam reforming and power generation)

RN 7440-31-5 HCA

CN Tin (8CI, 9CI) (CA INDEX NAME)

Sn

IT **1333-74-0P**, Hydrogen, preparation
(autothermal combustion system for steam reforming and power generation)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, uses
(autothermal combustion system for steam reforming and power generation)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B003-02
ICS C01B003-04; C01B003-26; C10G035-06

NCL 208134000

CC 51-12 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 47, 52, 57

ST combustion system **catalytic** autothermal; steam reforming autothermal combustion system; hydrogen prodn autothermal combustion system; power generation autothermal combustion system

IT **Catalyst** supports
Combustion
Combustion **catalysts**
Diesel fuel
Jet aircraft fuel
Steam reforming
Steam reforming **catalysts**
(autothermal combustion system for steam reforming and power generation)

IT Zeolites (synthetic), uses
(**catalyst** supports; autothermal combustion system for steam reforming and power generation)

IT Reactors
(**catalytic**; autothermal combustion system for steam reforming and power generation)

IT Ceramics
(porous, **catalyst** supports; autothermal combustion system for steam reforming and power generation)

IT 1307-96-6, Cobalt (II) oxide, uses 1308-04-9, Cobalt (III) oxide 1308-38-9, Chromium oxide (Cr2O3), uses 1309-37-1, Ferric oxide, uses 1313-13-9, Manganese (IV) oxide, uses 1313-99-1, Nickel oxide (NiO), uses 1317-34-6, Manganese (III) oxide 1344-43-0, Manganese (II) oxide, uses 1345-25-1, Ferrous oxide, uses 7440-02-0, Nickel, uses **7440-31-5**, Tin, uses 12017-00-4, Cobalt oxide (CoO2) 12018-01-8, Chromium (IV) oxide 18282-10-5, Tin oxide (SnO2) 37367-98-9, Molybdic acid, Calcium salt
(autothermal combustion system for steam reforming and power generation)

IT **1333-74-0P**, Hydrogen, preparation 7727-37-9P, Nitrogen, preparation
(autothermal combustion system for steam reforming and power generation)

IT 67-56-1, Methanol, uses 74-82-8, Methane, uses **630-08-0**, **Carbon monoxide**, uses 7664-41-7, Ammonia, uses
(autothermal combustion system for steam reforming and power generation)

IT 409-21-2, Silicon carbide (SiC), uses 471-34-1, Calcium carbonate, uses 1302-88-1, Cordierite 1305-78-8, Calcium oxide, uses 1309-48-4, Magnesia, uses 1344-28-1, Alumina, uses 7631-86-9, Silica, uses
(**catalyst** supports; autothermal combustion system for steam reforming and power generation)

L51 ANSWER 26 OF 30 HCA

Viewed Pt catalyst

123:318015 Procedure and apparatus for **carbon monoxide** removal from methanol/steam **reforming** process gas. Steinwandel, Juergen; Jehle, Walter; Staneff, Theodor (Daimler-Benz A.-G., Germany). Ger. Offen. DE 4408962 A1 19950921, 5 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1994-4408962 19940316.

AB CO is removed from the MeOH/steam **reforming** process gas by conversion to C and CO2 according to the Boudouard equil. C is sepd. by deposition on a Fe-group (i.e., Fe, Co, Ni) or Pd

catalyst on a kieselguhr support at .ltoreq.350.degree..
The C-loaded **catalyst** is regenerated by C oxidn. in an
O-contg. **gas stream**. Optionally, the (
CO + CO2)-contg. **gas** mixt. exiting the regenerated
reactor is fed into another reactor contg. a Pt **catalyst**
where the final CO oxidn. is performed. The **reforming** is
done in 1 **reforming** reactor with attached .gtoreq.2
alternating carbonization reactors (i.e., with 1 reactor in the
process mode and 1 reactor in the regeneration mode). The resulting
H2/CO2 mixt. contg. <50 ppm CO is suitable for **fuel
cells** in motor vehicles.

IT **1333-74-0P**, Hydrogen, preparation
(**carbon monoxide** removal from methanol/steam
reforming process gas in manuf. of)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses
(for **carbon monoxide** removal from
methanol/steam **reforming** process gas)

RN 7439-89-6 HCA

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **630-08-0**, **Carbon monoxide**, processes
(removal from methanol/steam **reforming** process gas)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B003-50
ICS H01M008-06; H01M008-22

ICA B01J023-80; B01J021-04; B01J023-74; B01J023-44; B01J021-08;
B01J023-94; B01J023-96

CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52

ST **carbon monoxide** removal steam **reforming**

IT Reactors
(for **carbon monoxide** removal from

methanol/steam **reforming** process gas)
IT **Fuel cells**
(hydrogen manuf. by methanol/steam **reforming** for)
IT **Reforming**
(steam, **carbon monoxide** removal from
methanol/steam **reforming** process gas)
IT 67-56-1, Methanol, processes
(**carbon monoxide** removal from methanol/steam
reforming process gas)
IT **1333-74-0P**, Hydrogen, preparation
(**carbon monoxide** removal from methanol/steam
reforming process gas in manuf. of)
IT **7439-89-6**, Iron, uses 7440-02-0, Nickel, uses 7440-05-3,
Palladium, uses 7440-06-4, Platinum, uses **7440-48-4**,
Cobalt, uses
(for **carbon monoxide** removal from
methanol/steam **reforming** process gas)
IT **630-08-0**, **Carbon monoxide**, processes
(removal from methanol/steam **reforming** process gas)

L51 ANSWER 27 OF 30 HCA COPYRIGHT 2003 ACS on STN
121:61419 A fuel conditioning system for a methanol-**fuelled**
PEM fuel cell power generator. Mann,
Ronald F.; Amphlett, John C.; Peppley, Brant A. (R. Mil. Coll.
Canada, Kingston, ON, K7K 5L0, Can.). Frontiers Science Series,
7(New Energy Systems and Conversions), 613-18 (English) 1993.
CODEN: FCFUEO. ISSN: 0915-8502.
AB A fuel conditioning system to supply **H**-rich **gas**
to a MeOH-fueled **PEM** (proton-exchange membrane)
fuel cell power generator is discussed. Kinetic
equations for the **catalytic** steam **reforming** of
MeOH on $CuO/ZnO/Al_2O_3$ **catalyst** and the preferential oxidn.
of CO on Pt/Al_2O_3 **catalyst** were presented with a brief
discussion of the reactor design procedure. A review of current
MeOH steam **reformer** technol. was given with comments on
the advantages of each design. Alternative schemes for the CO
management system were discussed with ref. to various aspects of the
design of this sub-system. The importance of effective system
integration and the key issues in system optimization for
terrestrial vehicle applications and **air**-independent
submersible applications were discussed.
IT **1317-38-0**, Cupric oxide, uses
(**catalyst**, contg. zinc oxide, alumina-supported, for
steam **reforming** of methanol, for proton-exchange
membrane **fuel cells**)
RN 1317-38-0 HCA
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)

Cu=O

IT **630-08-0**, **Carbon monoxide**, reactions

(oxidn. of, over platinum-alumina **catalyst** in
fuel cells, kinetics of)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** proton exchange membrane;
catalytic steam **reforming** methanol **fuel cell**
IT Kinetics of oxidation
(of **carbon monoxide**, over platinum/alumina **catalyst** in **fuel cells**)
IT **Fuel cells**
(proton-exchange membrane, **catalytic** steam **reforming** of methanol for and **carbon monoxide** oxidn. in, kinetics of)
IT Kinetics of **reforming**
(steam, of methanol, for proton-exchange membrane **fuel cells**)
IT Fuel gas manufacturing
(steam **reforming**, of methanol, for proton-exchange membrane **fuel cells**, kinetics of)
IT 1344-28-1, Alumina, uses
(**catalyst**, contg. cupric oxide and zinc oxide, for steam **reforming** of methanol, for proton-exchange membrane **fuel cells**)
IT 1314-13-2, Zinc oxide, uses
(**catalyst**, contg. cupric oxide, alumina-supported, for steam **reforming** of methanol, for proton-exchange membrane **fuel cells**)
IT **1317-38-0**, Cupric oxide, uses
(**catalyst**, contg. zinc oxide, alumina-supported, for steam **reforming** of methanol, for proton-exchange membrane **fuel cells**)
IT 7440-06-4, Platinum, uses
(**catalyst**, for **oxidn.** of **carbon monoxide**, in **fuel cells**, kinetics of)
IT 67-56-1, Methanol, reactions
(**catalytic** steam **reforming** of, for proton-exchange membrane **fuel cells**)
IT **630-08-0**, **Carbon monoxide**, reactions
(oxidn. of, over platinum-alumina **catalyst** in **fuel cells**, kinetics of)

ND Pt/Ru

L51 ANSWER 28 OF 30 HCA COPYRIGHT 2003 ACS on STN
121:13875 Utilization of methanol for polymer electrolyte **fuel cells** in mobile systems. Schmidt, V. M.; Broeckerhoff, P.; Hoehlein, B.; Menzer, R.; Stimming, U. (Inst. Energy Process Eng., Res. Cent. Juelich, Juelich, 52425, Germany). Journal of Power

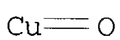
Sources, 49(1-3), 299-313 (English) 1994. CODEN: JPSODZ. ISSN: 0378-7753.

AB As part of the **fuel cell** program of the Juelich Research Center a vehicle propulsion system with methanol as secondary energy carrier and a **polymer electrolyte membrane fuel cell** (PEMFC) as the main component for energy conversion was developed. The fuel gas is produced by a heterogeneously **catalyzed** steam **reforming** reaction in which methanol is converted to **H2**, CO and CO2. The required energy is provided by the **catalytic** conversion of methanol for both heating up the system and **reforming** methanol. The high CO content of the fuel gas requires further processing of the gas or the development of new electrocatalysts for the anode. Various Pt-Ru alloys show promising behavior as CO-tolerant anodes. The entire **fuel cell** system is discussed in terms of energy and emission balances. The development of important components is described and exptl. results are discussed.

IT **1317-38-0**, Copper oxide (CuO), uses
(**catalyst** of zinc and, on alumina, for steam **reforming** of methanol, for **fuel cell**)

RN 1317-38-0 HCA

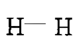
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)



IT **1333-74-0P**, Hydrogen, preparation
(manuf. of, by steam **reforming** of methanol, for **fuel cell** for elec. vehicle)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0P**, **Carbon monoxide**, preparation
(prepn. of, in steam **reforming** of methanol for hydrogen manuf., for **fuel cell**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 67, 72

ST methanol **reforming fuel cell** automobile; **catalytic** conversion methanol elec car

IT **Fuel-cell** electrolytes
(Nafion 117, in **fuel cell** coupled to steam **reforming** of methanol)

IT Carbon black, uses
(electrodes contg. platinum-ruthenium **catalyst** on, in electrodes of **fuel cell** for traction)
IT **Fuel cells**
(hydrogen-**air**, polymer membrane, steam **reforming** of methanol coupled to, for elec. vehicle)
IT **Oxidation catalysts**
(platinum-ruthenium, **carbon monoxide** -tolerant, for electrodes of **fuel cell** coupled to methanol **reforming**)
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, electrolyte membrane, in **fuel cell** coupled to methanol **reforming** , for elec. vehicle)
IT Fluoropolymers
(polyoxyalkylene-, sulfo-contg., ionomers, electrolyte membrane, in **fuel cell** coupled to methanol **reforming**, for elec. vehicle)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., electrolyte membrane, in **fuel cell** coupled to methanol **reforming**, for elec. vehicle)
IT **Reforming**
(steam, of methanol, **fuel cell** coupled to, for elec. vehicle)
IT 7440-66-6, Zinc, uses
(**catalyst** of copper oxide and, on alumina, for steam **reforming** of methanol, for **fuel cell**)
IT **1317-38-0**, Copper oxide (CuO), uses
(**catalyst** of zinc and, on alumina, for steam **reforming** of methanol, for **fuel cell**)
IT 12613-88-6, Platinum 50, ruthenium 50
(**catalyst**, on carbon black, **carbon monoxide**-tolerant, in electrode of **fuel cell** for elec. vehicle)
IT 66796-30-3, Nafion 117
(electrolyte membrane, in **fuel cell** coupled to methanol **reforming**, for elec. vehicle)
IT **1333-74-0P**, Hydrogen, preparation
(manuf. of, by steam **reforming** of methanol, for **fuel cell** for elec. vehicle)
IT **630-08-0P**, **Carbon monoxide**, preparation
(prepn. of, in steam **reforming** of methanol for hydrogen manuf., for **fuel cell**)
IT 67-56-1, Methanol, reactions
(steam **reforming** and **catalytic** conversion of, **fuel cell** coupled to, for elec. vehicle)

Mo, but Methanol ox.

L51 ANSWER 29 OF 30 HCA COPYRIGHT 2003 ACS on STN
118:68831 Electrocatalysis on SPE membrane electrodes. Kita, Hideaki; Nakajima, Hiroshi; Shimazu, Katsuaki (Fac. Sci., Hokkaido Univ., Sapporo, 060, Japan). Electrochem. Transition, 619-28. Editor(s):

Murphy, Oliver J.; Srinivasan, Supramaniam; Conway, Brian E. Plenum: New York, N. Y. (English) 1992. CODEN: 58OJAE.

AB The present study shows many advantages of the SPE (solid polymer electrolyte) electrode. It has a high roughness factor of several hundreds for Pt, a const. **catalytic** activity without a decay as obsd. at a Pt electrode, a high c.d. for electrode reactions of sparingly sol. species, and many features characteristic of the resp. electrode reactions. For example, CO oxidn. at a Au-SPE electrode in alk. media proceeds without a pH change because the product leaves the electrode as CO2 gas, not penetrating the membrane as CO32-. The molybdenum-modified Pt-SPE electrode reveals an excellent **catalytic** activity for MeOH oxidn., which is much higher than that of the Mo-modified Pt electrode. Thus, the SPE membrane electrode has promising features for its use in various electrode reactions, esp. in **fuel cells**.

IT **7439-98-7**, Molybdenum, uses
(**catalyst**, for **oxidn**. of methanol at platinum electrode with solid **polymer electrolyte membrane**)

RN 7439-98-7 HCA

CN Molybdenum (8CI, 9CI) (CA INDEX NAME)

Mo

IT **630-08-0**, **Carbon monoxide**, reactions
(oxidn. of, electrochem., at gold electrode with anion-exchanging membrane)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IT **1333-74-0**, Hydrogen, reactions
(oxidn. of, electrochem., at platinum solid-**polymer electrolyte membrane**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, reactions
(redn. of, electrochem., at platinum-solid **polymer electrolyte membrane**)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

CC 72-2 (Electrochemistry)
Section cross-reference(s): 22, 38, 52, 67
ST electrocatalysis solid **polymer electrolyte membrane** electrode; molybdenum **catalyst** methanol electrooxidn; **carbon monoxide** electrooxidn gold polymer electrolyte; **fuel cell** electrode solid polymer electrolyte; platinum electrode solid **polymer electrolyte membrane**; gold electrode solid **polymer electrolyte membrane**
IT Oxidation, electrochemical
(of **carbon monoxide** and oxygen at gold or platinum electrode with solid polymer electrolyte and of methanol at molybdenum-modified platinum-solid polymer electrolyte electrode)
IT Reduction, electrochemical
(of oxygen at platinum-solid **polymer electrolyte membrane**)
IT **Catalysts** and **Catalysis**
(electrochem., at solid **polymer electrolyte membrane**)
IT **Oxidation catalysts**
(electrochem., molybdenum, platinum-solid polymer electrolyte electrode modified with, for methanol)
IT Electrodes
(**fuel-cell**, **membrane**, solid **polymer electrolyte**)
IT **7439-98-7**, Molybdenum, uses
(**catalyst**, for **oxidn**. of methanol at platinum electrode with solid **polymer electrolyte membrane**)
IT 7440-06-4, Platinum, uses 7440-57-5, Gold, uses
(electrode, with solid **polymer electrolyte membrane**, roughness and electrocatalysis in relation to)
IT 124-38-9P, Carbon dioxide, preparation
(formation of, in **carbon monoxide** oxidn. on gold electrode with anion-exchanging membrane)
IT **630-08-0**, **Carbon monoxide**, reactions
(oxidn. of, electrochem., at gold electrode with anion-exchanging membrane)
IT **1333-74-0**, Hydrogen, reactions
(oxidn. of, electrochem., at platinum solid-**polymer electrolyte membrane**)
IT **7782-44-7**, Oxygen, reactions
(redn. of, electrochem., at platinum-solid **polymer electrolyte membrane**)

L51 ANSWER 30 OF 30 HCA COPYRIGHT 2003 ACS on STN NO CO-ox?
58:37924 Original Reference No. 58:6446d-e **Fuel cell** electrode processes. Young, George G.; Rozelle, Ralph B. (Alfred Univ., Alfred, NY). United States Department of Commerce, Office of Technical Services, AD [ASTIA Document], 264,264, 12 pp.

(Unavailable) 1961. CODEN: XCTAAO. ISSN: 0099-8559.

AB cf. CA 57, 4452c. Studies were made on low temp. and pressure cells with aq. KOH, NaOH, and K2CO3 electrolytes. Emphasis was on H, but data were also obtained on CO, C2H4, and C2H2. Two different porous C electrodes contg. metal **catalysts** were used. The C with higher total porosity and higher mean pore diam. was the better anode for H. Group VIII metals appear as most efficient **catalysts** for H and C3H8. Pt appears best. KOH was better than K2CO3 as electrolyte for the O cathode.

IT **7440-33-7**, Tungsten
(**catalysts**, H **fuel-cell** anodes contg.)

RN 7440-33-7 HCA

CN Tungsten (8CI, 9CI) (CA INDEX NAME)

W

IT **1333-74-0**, Hydrogen
(**fuel cells**, C anodes for, contg. metal **catalysts**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen
(**fuel cells**, electrolytes for)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

CC 15 (Electrochemistry)

IT Electrodes
(**fuel-cell**, reactions at metal **catalyst**-contg. C)

IT **Catalysts** and **Catalysis**
(hydrogen **fuel cell** electrodes contg. metal)

IT **Carbon monoxide**, dimethyl mercaptole
(**fuel cells** using, C anodes for, contg. metal **catalysts**)

IT 7439-88-5, Iridium
(anodes, **fuel cell**, for H)

IT 7440-05-3, Palladium
(carbon **fuel-cell** anodes contg.)

IT 7439-89-6, Iron
(**catalysts**, H **fuel cell** anodes contg.)

IT 7440-18-8, Ruthenium 7440-22-4, Silver **7440-33-7**,

Tungsten
(**catalysts**, H **fuel-cell** anodes contg.)
IT 7440-06-4, Platinum
(**catalysts**, **fuel-cell** (H) anodes contg.)
IT 7440-50-8, Copper
(**catalysts**, hydrogen **fuel cell** anodes contg.)
IT 7440-16-6, Rhodium 7440-48-4, Cobalt
(**catalysts**, hydrogen **fuel-cell** anodes contg.)
IT 7440-04-2, Osmium
(**catalysts**, in **fuel cells**)
IT 74-98-6, Propane
(**fuel cells** from, reactions at electrodes in)
IT 74-85-1, Ethylene 74-86-2, Acetylene
(**fuel cells** using, C anodes for, contg. metal **catalysts**)
IT 584-08-7, Potassium carbonate, K2CO3 1310-73-2, Sodium hydroxide
(**fuel cells** with electrolytes from)
IT **1333-74-0**, Hydrogen
(**fuel cells**, C anodes for, contg. metal **catalysts**)
IT **7782-44-7**, Oxygen
(**fuel cells**, electrolytes for)
IT 1310-58-3, Potassium hydroxide
(**fuel-cell** electrolytes contg.)
IT 7440-57-5, Gold
(hydrogen **fuel-cell** anodes contg. **catalysts** from)
IT 7440-02-0, Nickel
(in alkylation of N-phenyl-p-phenylenediamine with pentyl alc., H **fuel cell** anodes contg.)

=> d l52 1-27 cbib abs hitstr hitind

80

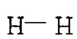
L52 ANSWER 1 OF 27 HCA COPYRIGHT 2003 ACS on STN
139:182788 The nature and binding strength of carbon adspecies formed during the equilibrium dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**. Triantafyllopoulos, Nikolaos C.; Neophytides, Stylianos G. (Foundation of Research and Technology Hellas, Institute of Chemical Engineering & High Temperature Processes, Rion Achaias, GR-26504, Greece). Journal of Catalysis, 217(2), 324-333 (English) 2003. CODEN: JCTLA5. ISSN: 0021-9517. Publisher: Elsevier Science.
AB The equil. dissociative adsorption of CH4 was studied over Ni-YSZ cermet **catalysts** for a deeper insight regarding the nature and binding strength of generated carbon species on the Ni-YSZ surface. Three main carbon species were detected by the reaction of carbon ad-species with **H2** to produce CH4 or with

O_2 to produce CO and CO_2. Carbidic species (Cc) are reactive with **H_2** and **O_2** at temps. <600 .degree.K while adsorbed carbon (Ca) species in equil. with CH_x species react with **H_2** and **O_2** >600 .degree.K. Graphitic carbon layers (Cg) are formed upon CH_4 adsorption >700 .degree.K and its main characteristic is the absence of any reactivity with **H_2** , to form CH_4. The binding energy of Ca species with respect to graphite decreases with increasing coverage ranging between 7.32 .+-. 0.03 and 6.5 .+-. 0.04 eV for the low (< 0.2 ML) and high (.apprxeq.1 ML) coverage, resp. The presence of 1% wt. of Mo either suppresses the formation of adsorbed graphitic layers which are not reactive with **H_2** or enhances the reactivity of adsorbed hydrogen atoms toward CH_4 at temps. >800 .degree.K, thus revealing the pos. effect of Mo in inhibiting the formation of adsorbed graphitic layers.

IT **1333-74-0**, Hydrogen, reactions
(**catalyst** preredn.; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH_4 on Ni-YSZ cermet **catalysts**)

RN 1333-74-0 HCA

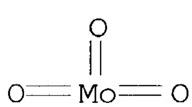
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **1313-27-5**, Molybdenum oxide (MoO_3), reactions
7782-44-7, Oxygen, reactions
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH_4 on Ni-YSZ cermet **catalysts**)

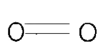
RN 1313-27-5 HCA

CN Molybdenum oxide (MoO_3) (7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, formation (nonpreparative)
(quant. burnoff; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH_4 on Ni-YSZ cermet **catalysts**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$-C \equiv O^+$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 51, 67
ST carbon adspecies equil dissociative adsorption methane nickel molybdenum YSZ; solid oxide **fuel cell** cermet methane electrochem **oxidn catalyst**
IT Adsorption enthalpy
Cermets
Dissociative chemisorption
Dissociative chemisorption enthalpy
Oxidation, electrochemical
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT Solid state **fuel cells**
(oxide; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT **1333-74-0**, Hydrogen, reactions
(**catalyst** preredn.; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 7440-44-0, Carbon, reactions
(deposits on anode; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 12012-02-1, Nickel carbide (Ni3C)
(formed on **catalyst**; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 7440-02-0P, Nickel, uses
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 67-63-0, 2-Propanol, uses
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 1071-76-7, Zirconium tetra-n-butoxide **1313-27-5**, Molybdenum oxide (MoO3), reactions 7664-41-7, Ammonia, reactions 7697-37-2, Nitric acid, reactions **7782-44-7**, Oxygen, reactions 13478-00-7, Nickel nitrate hexahydrate 13494-98-9, Yttrium nitrate hexahydrate
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)
IT 74-82-8, Methane, uses
(nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 64417-98-7P, Yttrium zirconium oxide
(nickel and nickel/molybdenum -loaded; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 62649-98-3P
(phase in Ni-Mo/YSZ **catalyst**; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 1313-99-1P, Nickel oxide (NiO), uses
(phase in pre-reduced **catalyst**; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
630-08-0, **Carbon monoxide**, formation (nonpreparative)
(quant. burnoff; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 1314-23-4P, Zirconia, uses
(yttria-stabilized, nickel and nickel/molybdenum -loaded; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

IT 1314-36-9P, Yttria, uses
(zirconia stabilized by, nickel and nickel/molybdenum -loaded; nature and binding strength of carbon ad-species formed during equil. dissociative adsorption of CH4 on Ni-YSZ cermet **catalysts**)

L52 ANSWER 2 OF 27 HCA COPYRIGHT 2003 ACS on STN NO
139:56985 Enhancement of the OSC properties of Ce-Zr based solid solutions. Nunan, John Gerard; Bortun, Anatoly I. (Delphi Technologies, Inc., USA). U.S. US 6585944 B1 20030701, 24 pp. (English). CODEN: USXXAM. APPLICATION: US 2000-690208 20001017.

AB The present invention relates to high oxygen ion conducting/oxygen storage (OIC/OS) capacity materials, a **catalyst** employing the OIC/OS materials, and a method for converting hydrocarbons, **carbon monoxide** and nitrogen oxides using the **catalyst**. The OIC/OS materials have stable cubic cryst. structures such that after aging for greater than about 36 h at temps. up to about 1,200 .degree.C, greater than about 60-95% of the cerium present is reducible. These materials comprise up to about 95 mol percent (mol %) zirconium, up to about 50 mol % cerium, up to about 20 mol % of a stabilizer such as yttrium, rare earth elements, and the like; and about 0.01 to about 25 mol % of a base metal selected from the group consisting of iron, copper, cobalt, nickel, silver, manganese, bismuth and mixts. comprising at least one of the foregoing metals. Due to the enhanced phase stability and oxygen ion conducting properties of these OIC/OS materials, they can be employed in numerous applications, including: in solid oxide **fuel cells** (SOFC) for energy conversion, in electrochem. oxygen sensors, in oxygen ion pumps, structural

ceramics of high toughness, in heating elements, in electrochem. reactors, in steam electrolysis cells, in electrochromic materials, in MHD (MHD) generators, in hydrogen sensors, in **catalysts** for methanol decompn., as potential hosts for immobilizing nuclear waste, as oxygen storage materials in three-way-conversion (TWC) **catalysts**, as well as in other **applications** where . **oxygen** storage capacity and/or oxygen ion cond. are factors.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses
(enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

RN 7439-89-6 HCA

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **630-08-0**, **Carbon monoxide**, processes
(enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C{\equiv}O^{+}$

IT **7782-44-7**, Oxygen, analysis
(sensors, electrochem.; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IC ICM B01D053-56

NCL 423239100; 423245100; 423247000; 502302000; 502304000; 502340000; 502349000; 502355000

CC 59-3 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 47, 52, 58, 67, 77

IT Decomposition **catalysts**
(for methanol decompn.; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **Gas** sensors
(**hydrogen**; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT Solid state **fuel cells**
(oxide; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT Exhaust **gas catalytic** converters
(**oxygen** storage **catalysts**; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **Gas** sensors
(**oxygen**, electrochem.; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **Catalysts**
(three-way; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **7439-89-6**, Iron, uses 7439-96-5, Manganese, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-45-1, Cerium, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses 7440-65-5, Yttrium, uses 7440-67-7, Zirconium, uses 7440-69-9, Bismuth, uses 547768-98-9 547768-99-0, Cerium iron yttrium zirconium oxide (Ce0.1Fe0.04Y0.12Zr0.74O1.92) 547769-00-6, Cerium iron yttrium zirconium oxide (Ce0.15Fe0.04Y0.12Zr0.69O1.92) 547769-01-7, Cerium iron yttrium zirconium oxide (Ce0.2Fe0.04Y0.12Zr0.64O1.92) 547769-02-8, Cerium iron yttrium zirconium oxide (Ce0.25Fe0.04Y0.12Zr0.59O1.92) 547769-03-9, Cerium iron yttrium zirconium oxide (Ce0.3Fe0.04Y0.12Zr0.54O2.92) 547769-04-0, Cerium iron yttrium zirconium oxide (Ce0.35Fe0.04Y0.12Zr0.49O1.92) 547769-05-1, Cerium iron yttrium zirconium oxide (Ce0.4Fe0.04Y0.12Zr0.44O1.92) 547769-06-2, Cerium iron yttrium zirconium oxide (Ce0.45Fe0.04Y0.12Zr0.39O1.92) 547769-07-3, Cerium iron yttrium zirconium oxide (Ce0.5Fe0.04Y0.12Zr0.34O1.92) 547769-08-4, Cerium iron yttrium zirconium oxide (Ce0.1Fe0.05Y0.1Zr0.75O1.92) 547769-09-5, Cerium iron yttrium zirconium oxide (Ce0.15Fe0.05Y0.1Zr0.7O1.92) 547769-10-8, Cerium iron yttrium zirconium oxide (Ce0.2Fe0.05Y0.1Zr0.65O1.92) 547769-11-9, Cerium iron yttrium zirconium oxide (Ce0.25Fe0.05Y0.1Zr0.6O1.92) 547769-12-0, Cerium iron yttrium zirconium oxide (Ce0.3Fe0.05Y0.1Zr0.55O1.92) 547769-13-1, Cerium iron yttrium zirconium oxide (Ce0.35Fe0.05Y0.1Zr0.5O1.92) 547769-14-2, Cerium iron yttrium zirconium oxide (Ce0.4Fe0.05Y0.1Zr0.45O1.92) 547769-15-3, Cerium iron yttrium zirconium oxide (Ce0.45Fe0.05Y0.1Zr0.4O1.92) 547769-16-4, Cerium iron yttrium zirconium oxide (Ce0.5Fe0.05Y0.1Zr0.35O1.92) 547769-17-5, Cerium iron yttrium zirconium oxide (Ce0.37Fe0.03Y0.09Zr0.5O1.96) 547769-18-6, Cerium copper yttrium zirconium oxide (Ce0.35Cu0.03Y0.12Zr0.5O1.91) 547769-19-7, Cerium nickel yttrium zirconium oxide (Ce0.35Ni0.06Y0.15Zr0.44O1.86) 547769-20-0, Cerium iron yttrium zirconium oxide (Ce0.35Fe0.06Y0.15Zr0.44O1.9) 547769-21-1, Cerium

iron yttrium zirconium oxide (Ce0.3Fe0.1Y0.04Zr0.56O1.93)
547769-22-2, Cerium iron lanthanum zirconium oxide
(Ce0.35Fe0.1La0.1Zr0.45O1.9)
(enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **630-08-0**, **Carbon monoxide**, processes
11104-93-1, Nitrogen oxide, processes
(enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

IT **7782-44-7**, Oxygen, analysis
(sensors, electrochem.; enhancement of the oxygen storage capacity properties of Ce-Zr based solid solns.)

 8D

139:55410 A CuO-CeO2 Mixed-Oxide **Catalyst** for CO Clean-Up by Selective Oxidation in Hydrogen-Rich Mixtures. Kim, Dong Hyun; Cha, Jung Eun (Department of Chemical Engineering, Kyungpook National University, Taegu, 702-701, S. Korea). Catalysis Letters, 86(1-3), 107-112 (English) 2003. CODEN: CALEER. ISSN: 1011-372X. Publisher: Kluwer Academic/Plenum Publishers.

AB A CuO-CeO2 mixed-oxide **catalyst** was shown exptl. to be highly active and selective for the oxidn. of CO in hydrogen-rich mixts., and an attractive alternative to the noble metal **catalysts** presently used for CO clean-up in hydrogen mixts. for proton-exchange membrane **fuel cells** (PEMFC). Although the presence of H2O and CO2 in the feed decreased the activity and increased the reaction temp. considerably to achieve a given CO conversion with a reactor, the selectivity profile with respect to the conversion remained virtually the same. The effect of H2O and CO2 on the reaction was found to increase the required energy for redn. of the active copper species in the redox cycles undergone during the reaction. The **catalyst** showed a slow, reversible deactivation, but the activity was restored on heating the **catalyst** at 300 .degree.C, even under an inert flow. At space velocities above 42 g h m-3, the **catalyst** reduced the CO content to less than 10 ppm in the temp. range 166-176 .degree.C for a feed of 1% CO, 1% **O2**, 50% **H2**, 20% H2O, 13.5% CO2 and balance He. Hence, with this **catalyst** it is feasible to clean up the CO in a single-stage reactor with relatively small excess oxygen, which is in contrast to the typical multistage reactor systems using noble metal **catalysts**.

IT **1317-38-0**, Copper oxide CuO, uses
(CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

RN 1317-38-0 HCA

CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)

Cu═O

IT **1333-74-0**, Hydrogen, uses

(CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H— H

IT **630-08-0**, **Carbon monoxide**, processes
(oxidn.; CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-5 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 59, 67

ST copper oxide ceria **catalyst carbon monoxide oxidn** hydrogen mixt; **catalyst** mixed oxide **carbon monoxide** oxidn hydrogen rich mixt

IT **Oxidation catalysts**
(CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

IT **Fuel cells**
(proton-exchange membrane; CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

IT Fuel gas manufacturing
(steam **reforming**; CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts. in relation to)

IT 1306-38-3, Ceria CeO2, uses **1317-38-0**, Copper oxide CuO, uses
(CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

IT **1333-74-0**, Hydrogen, uses
(CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

IT **630-08-0**, **Carbon monoxide**, processes
(oxidn.; CuO-CeO2 mixed-oxide **catalyst** for CO clean-up by selective oxidn. in hydrogen-rich mixts.)

L52 ANSWER 4 OF 27 HCA COPYRIGHT 2003 ACS on STN BD

138:257716 Influence of preparation method on performance of Cu/Zn-based **catalysts** for low-temperature steam **reforming** and oxidative steam **reforming** of methanol for **H2** production for **fuel cells**. Shen, Jian-Ping; Song, Chunshan (Department of Energy and Geo-Environmental Engineering, The Pennsylvania State University, University Park, PA, 16802, USA). Catalysis Today, 77(1-2), 89-98 (English) 2002.

CODEN: CATTEA. ISSN: 0920-5861. Publisher: Elsevier Science B.V..

AB Impregnation, co-pptn. and hydrothermal synthesis methods for prepn. of precursors for Cu/Zn/Al **catalysts** were compared. Steam **reforming** and oxidative steam **reforming** of MeOH was performed using lab.-prepd. and com. Cu/Zn/Al **catalysts** at 230.degree. for the **catalytic** prodn. of **H2**. The prepn. method influences **catalyst** performance with respect to MeOH conversion, **H2** yield and CO concn. The **catalyst** with lower Cu-redn. temp. shows higher activity for MeOH conversion at a lower temp. The best Cu/Zn/Al **catalyst** was prepd. by the co-pptn. method. At a temp. of 230.degree. the **catalyst** had a high activity for MeOH conversion (99-100%) and **H2** prodn. (71-76%) with very low CO concn. (0.05-0.15%) in steam **reforming** (H2O/MeOH mol ratio 1.43) and in oxidative steam **reforming** (**O2**/MeOH mol ratio 0.158-0.474).

IT **1317-38-0**, Cupric oxide, uses
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

RN 1317-38-0 HCA

CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)

Cu=O

IT **1333-74-0P**, Hydrogen, uses
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, formation (nonpreparative)
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST aluminum copper zinc **catalyst** prepn methanol steam **reforming**; hydrogen prodn methanol oxidative steam **reforming** copper zinc **catalyst**; **fuel cell** hydrogen prodn methanol steam **reforming catalyst**

IT Zeolite MCM-41
(**catalyst** support; influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT Steam **reforming**
Steam **reforming catalysts**
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT 1314-13-2, Zinc oxide, uses 1344-28-1, Alumina, uses
(**catalyst** contg.; influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT **1317-38-0**, Cupric oxide, uses
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT 56450-21-6P, Aluminum copper zinc oxide
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT 67-56-1, Methanol, processes
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT **1333-74-0P**, Hydrogen, uses
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
630-08-0, **Carbon monoxide**, formation (nonpreparative)
(influence of prepn. method on performance of copper/zinc-based **catalysts** for low-temp. steam **reforming** and oxidative steam **reforming** of methanol for hydrogen prodn. for **fuel cells**)

L52 ANSWER 5 OF 27 HCA BP

138:240537 CO removal from reformed fuel over Cu/ZnO/Al2O3 **catalysts** prepared by impregnation and coprecipitation methods. Tanaka, Yohei; Utaka, Toshimasa; Kikuchi, Ryuji; Sasaki, Kazunari; Eguchi, Koichi (Interdisciplinary Graduate School of Engineering Sciences, Department of Molecular and Material Sciences, Kyushu University, Kasuga-shi, Fukuoka, 816-8580, Japan). Applied Catalysis, A: General, 238(1), 11-18 (English) 2003. CODEN: ACAGE4. ISSN: 0926-860X. Publisher: Elsevier Science B.V..

AB A compn. of Cu/ZnO/Al2O3 **catalysts** prepd. by the impregnation method was optimized for water gas shift reaction (WGSR) coupled with CO oxidn. in the reformed gas. The optimum compn. of the impregnated **catalyst** for high WGSR activity was 5 wt.% Cu/5 wt.% ZnO/Al2O3. The optimum loading amts. of Cu and ZnO in the impregnated **catalyst** were smaller than those in the copptd. **catalyst**. Its **catalytic** activity above 200.degree.C was comparable to that of the conventional copptd. Cu/ZnO/Al2O3 **catalyst**. However, the activity of the impregnated Cu/ZnO/Al2O3 **catalysts** was significantly lowered at 150.degree.C, whereas no deactivation was obsd. for the copptd. **catalyst** at the same temp. Deactivation occurred over impregnated **catalysts** with H2O and/or **O2** in the reaction **gas**; it prevented **CO** adsorption on the surface.

IT **7440-50-8**, Copper, uses
(CO removal from reformed fuel over Cu/ZnO/Al2O3 **catalysts** prepd. by impregnation and copptn. methods)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, Hydrogen, preparation
(CO removal from reformed fuel over Cu/ZnO/Al2O3 **catalysts** prepd. by impregnation and copptn. methods)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, **processes**
(**CO** removal from reformed fuel over Cu/ZnO/Al2O3 **catalysts** prepd. by impregnation and copptn. methods)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** hydrogen **carbon monoxide** removal **oxidn catalyst**
IT **Fuel cells**
  Oxidation catalysts
 Water **gas** shift reaction
  (**CO** removal from reformed fuel over $Cu/ZnO/Al_2O_3$ **catalysts** prepd. by impregnation and copptn. methods)
IT 1314-13-2, Zinc oxide, uses 1344-28-1, Alumina, uses **7440-50-8**, Copper, uses
  (CO removal from reformed fuel over $Cu/ZnO/Al_2O_3$ **catalysts** prepd. by impregnation and copptn. methods)
IT **1333-74-0P**, Hydrogen, preparation
  (CO removal from reformed fuel over $Cu/ZnO/Al_2O_3$ **catalysts** prepd. by impregnation and copptn. methods)
IT **630-08-0**, **Carbon monoxide**, **processes**
  (**CO** removal from reformed fuel over $Cu/ZnO/Al_2O_3$ **catalysts** prepd. by impregnation and copptn. methods)

L52 ANSWER 6 OF 27 HCA BO
138:224013 Methanol reforming apparatus. Kimata, Fumikazu; Konagai, Nobutoshi; Yamamoto, Kosei (Suzuki Motor Corporation, Japan). U.S. Pat. Appl. Publ. US 2003049184 A1 20030313, 18 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-234239 20020905. PRIORITY: JP 2001-275912 20010912.
AB A compact, highly efficient methanol reforming app. having a stacked structure of thin sheets consists of a reforming section to produce hydrogen and CO, a combustion section with a combustion **catalyst** for supplying heat to the reforming section, and an oxidn. section for oxidizing CO to CO_2. An evapn. section is installed in front of the reforming section. The thin sheets comprise multiple pairs of passages, and spacers provided with multiple fluid channels. The oxidn. section is cooled by **air** which is also utilized for the methanol combustion. The compact reforming app. can be used to produce hydrogen as **fuel** for **fuel cells** in automobiles.
IT **1333-74-0P**, Hydrogen, uses
  (fuel; methanol reforming app.)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0P**, **Carbon monoxide**, preparation
  (methanol reforming app.)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IT **7440-50-8**, Copper, uses
(reforming **catalyst**; methanol reforming app.)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM B01J008-04
ICS F28D021-00
NCL 422188000; 422193000; 422198000
CC 51-11 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 52, 67
ST methanol reforming app hydrogen **fuel cell**
IT Combustion **catalysts**
Fuel cells
Oxidation
Oxidation catalysts
Reforming apparatus
Reforming **catalysts**
(methanol reforming app.)
IT 1344-28-1, Alumina, uses
(**catalyst** support; methanol reforming app.)
IT 7440-06-4, Platinum, uses
(combustion and **oxidn. catalyst**; methanol reforming app.)
IT **1333-74-0P**, Hydrogen, uses
(fuel; methanol reforming app.)
IT **630-08-0P**, **Carbon monoxide**, preparation
(methanol reforming app.)
IT 7440-18-8, Ruthenium, uses
(**oxidn. catalyst**; methanol reforming app.)
IT **7440-50-8**, Copper, uses 7440-66-6, Zinc, uses
(reforming **catalyst**; methanol reforming app.)

L52 ANSWER 7 OF 27 HCA COPYRIGHT 2003 ACS on STN nw
138:173248 **Catalytic** activities and polarization characteristics of LSM and NiO electrodes used in solid oxide electrolyte cell reactors. Wang, Shuqiang; Awano, Masanobu; Maeda, Kunihiro (Synergy Ceramics Laboratory, FCRA, Shidami Human Science Park, Nagoya, 463-8687, Japan). Proceedings - Electrochemical Society, 2000-22(Power Sources for the New Millennium), 134-141 (English) 2001. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
AB The **catalytic** activity and polarization of La0.8Sr0.2MnO3 (LSM) and NiO electrodes used in single-chamber solid oxide **fuel cells** were studied. The NiO electrode was a better **catalyst** for methane **oxidn**. than the LSM electrode. However, the reactions were depressed at both electrodes when the vol. ratio CH4:**O2** increased from 1:1 to 2.5:1. The difference in **catalytic** activity between the LSM and NiO electrodes could be controlled by changing the flow rate and

compn. of the gas or by adding other oxides to the electrodes. Sufficient EMF could be generated with single-chamber cells to directly use methane-**air** gas mixts.

IT **630-08-0**, **Carbon monoxide**, formation (nonpreparative) **1333-74-0**, Hydrogen, formation (nonpreparative)
(**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)

RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen, uses
(**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

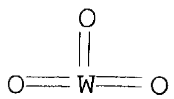
$O = O$

IT **1307-96-6**, Cobaltous oxide, uses **1309-37-1**, Ferric oxide, uses **1314-35-8**, Tungsten oxide (WO3), uses **12037-01-3**, Terbium oxide (Tb4O7)
(**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes with added oxides in solid oxide **fuel cells**)

RN 1307-96-6 HCA
CN Cobalt oxide (CoO) (8CI, 9CI) (CA INDEX NAME)

$Co = O$

RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
RN 1314-35-8 HCA
CN Tungsten oxide (WO3) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 12037-01-3 HCA
CN Terbium oxide (Tb4O7) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lanthanum manganese strontium oxide cathode **fuel cell**; nickel oxide anode **fuel cell**; methane **catalytic oxidn fuel cell** electrode
IT **Fuel cell** anodes
  Fuel cell cathodes
   (**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)
IT 1313-99-1, Nickel oxide (NiO), uses
   (anode; **catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)
IT 124-38-9, Carbon dioxide, formation (nonpreparative) **630-08-0**, **Carbon monoxide**, formation (nonpreparative) **1333-74-0**, Hydrogen, formation (nonpreparative)
   (**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)
IT 74-82-8, Methane, uses **7782-44-7**, Oxygen, uses
   (**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells fueled** with different methane-oxygen mixts.)
IT 1306-38-3, Ceria, uses **1307-96-6**, Cobaltous oxide, uses **1309-37-1**, Ferric oxide, uses 1312-43-2, Indium oxide (In2O3) 1313-13-9, Manganese oxide (MnO2), uses 1313-97-9, Neodymium oxide (Nd2O3) **1314-35-8**, Tungsten oxide (WO3), uses 12030-49-8, Iridium oxide (IrO2) 12036-10-1, Ruthenium oxide (RuO2) **12037-01-3**, Terbium oxide (Tb4O7) 12037-29-5, Praseodymium oxide (Pr6O11) 13463-67-7, Titanium oxide (TiO2), uses 55575-02-5, Cerium gadolinium oxide 64417-98-7, Yttrium zirconium oxide
   (**catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes with added oxides in solid oxide **fuel cells**)
IT 108916-22-9, Lanthanum manganese strontium oxide (La0.8MnSr0.2O3)
   (cathode; **catalytic** activity and polarization

characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes in solid oxide **fuel cells** **fueled** with different methane-oxygen mixts.)

IT 1314-23-4, Zirconium oxide (ZrO_2), uses
(yttria stabilized; **catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes with added oxides in solid oxide **fuel cells**)

IT 1314-36-9, Yttrium oxide (Y_2O_3), uses
(zirconia stabilized with; **catalytic** activity and polarization characteristics of lanthanum manganese strontium oxide and nickel oxide electrodes with added oxides in solid oxide **fuel cells**)

L52 ANSWER 8 OF 27 HCA COPYRIGHT 2003 ACS on STN B D

138:108779 **Oxygen**-assisted water **gas** shift reactor having a supported **catalyst**, and method for its use. Zhu, Tianli; Silver, Ronald G.; Emerson, Sean C.; Bellows, Richard J. (USA). U.S. Pat. Appl. Publ. US 2003026747 A1 20030206, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-919290 20010731.

AB A shift converter, or reactor, in a fuel processing subsystem, as for a **fuel cell**, uses an improved **catalyst** bed and the addn. of oxygen to reduce the amt. of **carbon monoxide** in a process gas stream. The **catalyst** of bed is a metal, preferably a noble metal, having a promoted support of metal oxide, preferably ceria and/or zirconia. A water gas shift reaction converts **carbon monoxide** to carbon dioxide. The **oxygen** may be **introduced** as **air**, and causes an improvement in **carbon monoxide** removal. Use of the added oxygen enables the shift reactor and its **catalyst** bed to be relatively more compact for performing a given level of **carbon monoxide** conversion. The **catalyst** bed obviates the requirement for prior reducing of **catalysts**, and minimizes the need to protect the **catalyst** from oxygen during operation and/or shutdown.

IT **7439-89-6**, Iron, uses
(**oxygen**-assisted water **gas** shift reactor having supported **catalyst**, and method for its use)

RN 7439-89-6 HCA

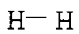
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

IT **1333-74-0P, Hydrogen, processes**
(**oxygen**-assisted water **gas** shift reactor having supported **catalyst**, and method for its use)

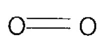
RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide,**
processes **7782-44-7**, **Oxygen,**
processes
(**oxygen**-assisted water **gas** shift reactor
having supported **catalyst**, and method for its use)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IC ICM B01J008-04
NCL 422190000
CC 47-1 (Apparatus and Plant Equipment)
Section cross-reference(s): 49, 52
ST **oxygen** assisted water **gas** shift reactor
supported **catalyst**
IT **Catalyst** supports
Fuel cells
Oxidation
Reactors
Water **gas** shift reaction
Water gas shift reaction **catalysts**
(**oxygen**-assisted water **gas** shift reactor
having supported **catalyst**, and method for its use)
IT Noble metals
Oxides (inorganic), uses
Platinum-group metals
(**oxygen**-assisted water **gas** shift reactor
having supported **catalyst**, and method for its use)
IT 1314-23-4, Zirconium oxide (ZrO_2), uses **7439-89-6**, Iron,
uses 7439-96-5, Manganese, uses 7440-02-0, Nickel, uses
7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6,
Rhodium, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses
7440-57-5, Gold, uses 11129-18-3, Cerium oxide
(**oxygen**-assisted water **gas** shift reactor
having supported **catalyst**, and method for its use)
IT **1333-74-0P**, **Hydrogen**, **processes**
(**oxygen**-assisted water **gas** shift reactor
having supported **catalyst**, and method for its use)
IT 124-38-9, Carbon dioxide, **processes** **630-08-0**,
Carbon monoxide, **processes** 7732-18-5,

Water, **processes 7782-44-7**, **Oxygen**, **processes**
(**oxygen**-assisted water **gas** shift reactor having supported **catalyst**, and method for its use)

L52 ANSWER 9 OF 27 HCA COPYRIGHT 2003 ACS on STN BP
137:203987 **Carbon monoxide** selective **oxidizing catalyst** and its manufacture. Kurachi, Saeko (Toyota Jidosha Kabushiki Kaisha, Japan). U.S. Pat. Appl. Publ. US 2002122755 A1 20020905, 25 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-86806 20020304. PRIORITY: JP 2001-60060 20010305.

AB This CO selective **oxidizing catalyst** includes a carrier of ferrierite or ZSM-5 that supports a metal component of Pt alone or Pt and at least one type of transition metal. Alternatively, a CO selective **oxidizing catalyst** includes a carrier whose max. pore diam. ranges from 0.55 to 0.65 nm and it supports Pt or Pt and at least one type of transition metal. **Hydrogen**-rich **gas** contg. **CO** is presented to this **catalyst** which promotes CO oxidn. in preference to H oxidn. The **catalyst** is manufd. through redn. processing.

IT **7439-89-6**, Iron, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses
(**carbon monoxide** selective **oxidizing catalyst**)

RN 7439-89-6 HCA
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

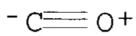
Cu

IT **1333-74-0**, Hydrogen, uses
(**carbon monoxide** selective **oxidizing catalyst**)

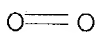
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
7782-44-7, Oxygen, reactions
(**carbon monoxide** selective **oxidizing catalyst**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)



RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IC ICM B01D053-62
NCL 422187000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST selective **oxidizing catalyst carbon monoxide** pore redn processing
IT **Fuel cells**
Pore size
(**carbon monoxide** selective **oxidizing catalyst**)
IT A zeolites
Beta zeolites
Ferrierite-type zeolites
Mordenite-type zeolites
Ultrastable Y zeolites
Zeolite ZSM-5
(**carbon monoxide** selective **oxidizing catalyst**)
IT Reduction
(**carbon monoxide** selective **oxidizing catalyst** manuf. through redn. processing)
IT **Oxidation catalysts**
(selective; **carbon monoxide** selective **oxidizing catalyst**)
IT 1344-28-1, Alumina, uses 7439-88-5, Iridium, uses
7439-89-6, Iron, uses 7439-96-5, Manganese, uses
7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-47-3, Chromium, uses **7440-48-4**, Cobalt, uses **7440-50-8**, Copper, uses
(**carbon monoxide** selective **oxidizing catalyst**)
IT 124-38-9, Carbon dioxide, uses **1333-74-0**, Hydrogen, uses
(**carbon monoxide** selective **oxidizing catalyst**)

IT 630-08-0, **Carbon monoxide**, reactions
7782-44-7, Oxygen, reactions
(**carbon monoxide** selective **oxidizing catalyst**)

Ag composite oxides

L52 ANSWER 10 OF 27 HCA COPYRIGHT 2003 ACS on STN
136:281859 Selective **carbon monoxide** oxidation over Ag-based composite oxides. Guldur, Cigdem; Balikci, Filiz (Chemical Engineering Department, Gazi University, Maltepe, Ankara, 06570, Turk.). International Journal of Hydrogen Energy, Volume Date 2002, 27(2), 219-224 (English) 2001. CODEN: IJHEDX. ISSN: 0360-3199. Publisher: Elsevier Science Ltd..

AB We report our results of the synthesis of 1:1 molar ratio of the silver cobalt and silver manganese composite oxide **catalysts** to remove **carbon monoxide** from hydrogen-rich fuels by the **catalytic oxidn**. reaction. **Catalysts** were synthesized by the co-pptn. method. XRD, BET, TGA, **catalytic** activity and **catalyst** deactivation studies were used to identify active **catalysts**. Both CO oxidn. and selective CO oxidn. were carried out in a microreactor by using a reaction gas mixt. of 1 vol% CO in **air** and another gas mixt. was prepd. by mixing 1 vol% CO, 2 vol% **O2**, 84 vol% **H2**, the balance being He. 15 vol% CO2 was added to the reactant gas mixt. in order to det. the effect of CO2, reaction gases were passed through the humidifier to det. the effect of the water vapor on the oxidn. reaction. Metal oxide base was decompd. to the metallic phase and surface areas of the **catalysts** were decreased when the calcination temp. increased from 200.degree.C to 500.degree.C. Ag/Co composite oxide **catalyst** calcined at 200.degree.C gave good activity at low temps. and 90% of CO conversion at 180.degree.C was obtained for the selective CO oxidn. reaction. The addn. of the impurities (CO2 or H2O) decreased the activity of **catalyst** for selective CO oxidn. in order to get highly rich hydrogen fuels.

IT **7440-48-4**, Cobalt, uses
(selective **carbon monoxide** oxidn. over Ag-based composite oxides)

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **630-08-0**, **Carbon monoxide**, processes
(selective **carbon monoxide** oxidn. over Ag-based composite oxides)

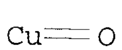
RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell carbon monoxide**
oxidn catalyst silver cobalt manganese
IT **Fuel cells**
Oxidation catalysts
(selective **carbon monoxide** oxidn. over
Ag-based composite oxides)
IT 7439-96-5, Manganese, uses 7440-22-4, Silver, uses
7440-48-4, Cobalt, uses
(selective **carbon monoxide** oxidn. over
Ag-based composite oxides)
IT 124-38-9, Carbon dioxide, processes **630-08-0**,
Carbon monoxide, processes 7732-18-5, Water,
processes
(selective **carbon monoxide** oxidn. over
Ag-based composite oxides)

L52 ANSWER 11 OF 27 HCA COPYRIGHT 2003 ACS on STN BO
135:79449 Production of hydrogen for **fuel cell** by
using heat-resistant steam-**reforming catalyst**.
Kushita, Yasuhiro; Hirose, Shigeyuki; Hiramatsu, Yasushi; Yoneoka,
Mikio; Isobe, Shoshi; Naka, Takahiro; Kuma, Hideaki; Koyama,
Masataka (Mitsubishi Gas Chemical Co., Ltd., Japan; Honda Motor Co.,
Ltd.). Jpn. Kokai Tokkyo Koho JP 2001185192 A2 20010706, 6 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-373630 19991228.
AB Methanol is allowed to react with steam and **air** in the
presence of steam **reforming catalyst** for
producing **H**-based **gas**. In the prodn., the
catalyst mainly comprises Cu oxide and Zn oxide and also
contains oxide of Zr compd. Alternatively, the **catalyst**
comprises a precursor mixt. of Cu compd. and Zn compd. contg. Zr
compd., and the compds. can change to oxides by being fired. The
catalyst has high heat resistance and **reforming**
activity, and **H**-based **gas** with low **CO**
content can be produced in high efficiency.
IT **1317-38-0P**, Copper oxide (CuO), uses
(steam **reforming** of methanol for prodn. of H for
fuel cell by using heat-resistant
catalyst)
RN 1317-38-0 HCA
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)



IT **1333-74-0P**, Hydrogen, preparation
(steam **reforming** of methanol for prodn. of H for
fuel cell by using heat-resistant
catalyst)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H— H

IC ICM H01M008-06
ICS B01J023-80; C01B003-32
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 57, 67
ST **fuel cell** hydrogen prodn steam **reforming catalyst** heat resistance; copper zinc zirconium oxide steam **reforming catalyst**
IT **Fuel cells**
Fuel gas manufacturing
Heat-resistant materials
Steam **reforming catalysts**
(steam **reforming** of methanol for prodn. of H for **fuel cell** by using heat-resistant **catalyst**)
IT 7758-98-7, Copper sulfate, uses 14644-61-2, Zirconium sulfate
(precursor; steam **reforming** of methanol for prodn. of H for **fuel cell** by using heat-resistant **catalyst**)
IT 1314-13-2P, Zinc oxide (ZnO), uses 1314-23-4P, Zirconium oxide (ZrO2), uses **1317-38-0P**, Copper oxide (CuO), uses 190586-31-3P, Copper zinc zirconium oxide
(steam **reforming** of methanol for prodn. of H for **fuel cell** by using heat-resistant **catalyst**)
IT **1333-74-0P**, Hydrogen, preparation
(steam **reforming** of methanol for prodn. of H for **fuel cell** by using heat-resistant **catalyst**)
IT 67-56-1, Methanol, reactions
(steam **reforming** of methanol for prodn. of H for **fuel cell** by using heat-resistant **catalyst**)

L52 ANSWER 12 OF 27 HCA COPYRIGHT 2003 ACS on STN

Pt|Fe
Viewed - Bad date

135:79052 Process for selective oxidation of **carbon monoxide** in a **hydrogen** containing **stream** for **fuel cell** feedstock. Brown, Scott (Phillips Petroleum Co., USA). PCT Int. Appl. WO 2001047806 A1 20010705, 16 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US42050 20001110. PRIORITY: US 1999-473157 19991228.
AB A process for the selective oxidn. of CO to CO2 in a hydrogen feed

(in the presence of **catalyst** contg. platinum and iron)
involves: (1) mixing an amt. of free **O** with the
gaseous mixt. comprising **H** and CO to provide an O
to CO mol ratio of 0.5-8.0 mol O/mol CO to form a second gaseous
mixt. and (2) contacting the second gaseous mixt. at 0-300.degree.
with an acid treated **catalyst** comprising Pt and Fe
impregnated on a support material thereby substantially completely
converting CO in the second gaseous mixt. to CO2. The
catalyst can be acid treated.

IT **7439-89-6**, Iron, uses
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)

RN 7439-89-6 HCA

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

IT **1333-74-0P**, **Hydrogen**, preparation
(**process** for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B031-20

CC 49-10 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52

ST **fuel cell** selective oxidn **carbon monoxide** hydrogen

IT **Fuel cells**
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)

IT Oxidation
Oxidation **catalysts**
(selective; process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream**

for **fuel cell** feedstock)
IT **7439-89-6**, Iron, uses 7440-06-4, Platinum, uses
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT 1344-28-1, Alumina, uses 11137-98-7, Magnesium aluminate
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT 124-38-9, Carbon dioxide, formation (nonpreparative)
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT 14024-18-1, Ferric acetylacetonate 15170-57-7, Platinum(II) acetylacetonate
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT 7697-37-2, Nitric acid, processes
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT **1333-74-0P**, **Hydrogen**, preparation
(**process** for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)
IT **630-08-0**, **Carbon monoxide**, reactions
(process for selective oxidn. of **carbon monoxide** in **hydrogen** contg. **stream** for **fuel cell** feedstock)

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US 6559094 Pt/Fe?

L52 ANSWER 13 OF 27 HCA COPYRIGHT 2003 ACS on STN
134:210589 Method for preparation of **catalytic** material for selective oxidation for **fuel cell** use.
Korotkikh, Olga; Farrauto, Robert J.; McFarland, Andrew (Engelhard Corporation, USA). PCT Int. Appl. WO 2001017681 A2 20010315, 70 pp. DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US23821 20000830. PRIORITY: US 1999-392813 19990909.
AB The invention pertains to the prepn. and use of **catalytic** materials and **catalyst** members for the selective oxidn. of **carbon monoxide** in a gas **stream** that contains **hydrogen**. One such **catalyst** member may be produced by depositing by elec. arc spraying a metal feedstock onto a metal substrate to provide a metal anchor layer on the substrate, and depositing a **catalytic** material comprising

platinum and iron dispersed on a refractory inorg. oxide support material onto the metal substrate. The **catalytic** material may optionally be produced by wetting the support material, esp. a particulate support material, with a platinum group metal soln. and iron soln. and drying and calcining the wetted support material in **air** at a temp. in the range of from 200.degree. to 300.degree., preferably using a soln. contg. bivalent platinum ion species. The **catalyst** member may be used by flowing the gas stream there-through at a temp. of about 90.degree. with an **O2**:CO ratio of about 1:1 and a space velocity of about 20,000/h or, alternatively, at a temp. of about 150.degree. with an **O2**:CO ratio of about 1.5:1 and a space velocity of about 80,000/h.

IT **7439-89-6**, Iron, uses
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)

RN 7439-89-6 HCA

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

IT **1333-74-0P**, Hydrogen, uses
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
7782-44-7, Oxygen, reactions
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IC ICM B01J037-08
ICS B01J023-89; B01D053-86

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST **catalyst** prepn selective oxidn **fuel cell**

IT **Fuel cells**
Fuel gases
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)
IT Oxidation
Oxidation **catalysts**
(selective; method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)
IT **7439-89-6**, Iron, uses 7440-06-4, Platinum, uses
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)
IT 1344-28-1, Alumina, uses
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)
IT **1333-74-0P**, Hydrogen, uses
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)
IT **630-08-0**, **Carbon monoxide**, reactions
7782-44-7, Oxygen, reactions 12704-83-5, Nickel aluminide
(method for prepn. of **catalytic** material for selective oxidn. for **fuel cell** use)

L52 ANSWER 14 OF 27 HCA COPYRIGHT 2003 ACS on STN Cu/Al2O3-ZnO
133:225483 Removal of CO from reformed fuel by shift reaction and selective oxidation. Utaka, Toshimasa; Eguchi, Koichi; Sekizawa, Koshi; Sasaki, Kazunari (Kyushu Univ., Japan). Society of Automotive Engineers, [Special Publication] SP, SP-1545(State of Alternative Fuel Technologies 2000), 95-96 (English) 2000. CODEN: SAESA2. ISSN: 0099-5908. Publisher: Society of Automotive Engineers.
AB Cu-based and noble metal **catalysts** for CO removal from methanol reformed gas were investigated for application to polymer electrolyte **fuel cells**. Over Cu-based **catalysts**, oxygen-assisted low-temp. CO shift reaction (combined shift reaction and CO oxidn.) enhanced CO removal considerably by the addn. of a small amt. of oxygen. While the Cu/Al2O3-ZnO **catalyst** exhibited a comparable activity with noble metal **catalysts** at low CO concn., it demonstrated a higher activity than Pt/Al2O3 at high CO concn.
IT **7440-50-8**, Copper, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **7782-44-7**, Oxygen, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IT **1333-74-0P**, Hydrogen, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**,
processes
(removal of **CO** from reformed fuel by shift reaction and selective oxidn.)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST **fuel cell** methanol reformed gas **carbon monoxide** removal; **oxidn catalyst** **carbon monoxide** removal methanol reformed gas; shift reaction **carbon monoxide** removal methanol reformed gas
IT **Fuel cells**
Fuel **gases**
Oxidation
Oxidation catalysts
Water gas shift reaction
Water gas shift reaction **catalysts**
(removal of **CO** from reformed fuel by shift reaction and selective oxidn.)
IT 1314-13-2, Zinc oxide, uses 1344-28-1, Alumina, uses
7440-50-8, Copper, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses 7631-86-9, Silica, uses **7782-44-7**, Oxygen, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
IT **1333-74-0P**, Hydrogen, uses
(removal of CO from reformed fuel by shift reaction and selective oxidn.)
IT **630-08-0**, **Carbon monoxide**,
processes

(removal of **CO** from reformed fuel by shift reaction and selective oxidn.)

L52 ANSWER 15 OF 27 HCA COPYRIGHT 2003 ACS on STN Cu + other stuff
132:336440 Method and **catalyst** for converting **carbon monoxide** in manufacture of hydrogen. Eguchi, Koichi; Sekisawa, Koshi; Utaka, Toshimasa; Yano, Seiichi; Arai, Hiromichi (Idemitsu Kosan Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000143209 A2 20000523, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-314203 19981105.

AB The method is carried out by contacting CO with steam and oxygen in the presence of **catalyst** contg. Cu; Al; and .gtoreq.1 metal oxides selected from ZnO; Cr oxide and MgO, to decrease CO concn. for producing **H2**-rich gas used in **fuel cells**.

IT **7440-50-8**, Copper, uses
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, Hydrogen, preparation
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, **Oxygen**, **processes**
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IT **630-08-0**, **Carbon monoxide**, processes
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM C01B003-48

ICS B01J021-02; B01J021-10; B01J023-06; B01J023-26; H01M008-06;
B01J023-72
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST **oxidn catalyst carbon monoxide**
hydrogen producing; **fuel cell** hydrogen
carbon monoxide catalyst
IT **Fuel cells**
Oxidation catalysts
Steam
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
IT Oxides (inorganic), uses
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
IT 1309-48-4, Magnesium oxide (MgO), uses 1314-13-2, Zinc oxide (ZnO), uses 7429-90-5, Aluminum, uses **7440-50-8**, Copper, uses 11118-57-3, Chromium oxide
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
IT **1333-74-0P**, Hydrogen, preparation
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
IT **7782-44-7**, **Oxygen, processes**
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)
IT **630-08-0**, **Carbon monoxide**, processes
(method and **catalyst** for converting **carbon monoxide** in manuf. of hydrogen)

L52 ANSWER 16 OF 27 HCA COPYRIGHT 2003 ACS on STN
132:210135 CO removal by **oxygen**-assisted water **gas** shift reaction over supported Cu **catalysts**. Utaka, T.; Sekizawa, K.; Eguchi, K. (Graduate School of Engineering Sciences, Department of Molecular and Material Sciences, Kyushu University, Kasuga, Fukuoka, Japan). Applied Catalysis, A: General, 194-195, 21-26 (English) 2000. CODEN: ACAGE4. ISSN: 0926-860X. Publisher: Elsevier Science B.V..
AB Supported Cu **catalysts** were investigated for CO removal in a gas mixt. after methanol steam reforming. Removal of CO in the post-reforming gas was effectively promoted by the addn. of **oxygen** in the **gas** mixt. Not only water gas shift reaction (WGSR; CO + H2O .fwdarw. CO2 + **H2**) but also CO oxidn. reaction (CO + 1/2O2 .fwdarw. CO2) was effective in reducing the CO concn. Although, **H2** oxidn. also proceeded by added oxygen, the concn. of CO significantly decreased without consuming a large amt. of **H2** with an increase in oxygen concn. The equil. concn. obtained from thermodn. data indicates that the reaction is desirable at lower temps. Cu/Al2O3-ZnO demonstrated an excellent activity for **catalytic** removal of CO by oxygen-assisted WGSR. The activity was enhanced without increasing **H2** conversion by employing longer contact time. These

results indicate that the design of an active shift/**oxidn.** **catalyst** operative at 100-150.degree. is a possible method for removal of very small amts. of CO in the reformed fuel.

IT **7440-50-8**, Copper, uses
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **7782-44-7**, Oxygen, uses
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **630-08-0**, **Carbon monoxide**, processes
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST **fuel cell** methanol steam reforming; water gas shift reaction **carbon monoxide** removal; reformed fuel **carbon monoxide** removal

IT Oxidation
(CO; **carbon monoxide** removal by **oxygen**-assisted water **gas** shift reaction over supported Cu **catalysts**)

IT **Oxidation catalysts**
Water gas shift reaction
Water gas shift reaction **catalysts**
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

IT **Fuel cells**
(polymer electrolyte; **carbon monoxide** removal by **oxygen**-assisted water **gas** shift reaction over supported Cu **catalysts**)

IT Fuel gas manufacturing
(steam reforming; **carbon monoxide** removal by **oxygen**-assisted water **gas** shift reaction over supported Cu **catalysts**)

IT 1309-48-4, Magnesium oxide, uses 1314-13-2, Zinc oxide, uses 1344-28-1, Alumina, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses **7440-50-8**, Copper, uses 7440-57-5, Gold, uses 11118-57-3, Chromium oxide 11129-60-5, Manganese oxide
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

IT **7782-44-7**, Oxygen, uses
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

IT **630-08-0**, **Carbon monoxide**, processes
(**carbon monoxide** removal by **oxygen** -assisted water **gas** shift reaction over supported Cu **catalysts**)

L52 ANSWER 17 OF 27 HCA Cu/Al2O3-ZnO

131:324961 Removal of CO from methanol reforming gas by low temperature shift reaction. Eguchi, Koichi; Yano, Sei-ichi; Utaka, Toshimasa; Sekizawa, Koshi; Arai, Hiromichi (Department of Molecular and Material Sciences, Graduate School of, Kyushu University, Fukuoka, 816-8580, Japan). Studies in Surface Science and Catalysis, 121(Science and Technology in Catalysis 1998), 445-448 (English) 1999. CODEN: SSCTDM. ISSN: 0167-2991. Publisher: Elsevier Science B.V..

AB Copper **catalysts** supported on mixed oxides were investigated for CO removal in the methanol steam reformed gas. Although Cu/Al2O3-ZnO demonstrated excellent activity for water gas shift reaction (WGSR; CO + H2O -> CO2 + **H2**), further removal of CO in the reformed gas applied as a fuel for polymer electrolyte **fuel cells** is required. It is difficult to remove trace CO in the reformed gas through WGSR, however, **O2** addn. to the reformed gas is effective to enhance the CO removal through CO oxidn. Cu/Al2O3-ZnO also demonstrated excellent activity for **catalytic** removal of CO by WGSR and selective CO oxidn. (CO + 1/2O2 -> CO2). This indicates that the design of an active shift/**oxidn.** **catalyst** operative at 100-150.degree. is a possible method for selective removal of CO in the methanol reforming gas.

IT **7440-50-8**, Copper, uses
(Cu/Al2O3-ZnO; removal of CO from methanol reforming gas by low temp. shift reaction)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **630-08-0, Carbon monoxide, processes**
(removal of **CO** from methanol reforming gas by low temp. shift reaction)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IT **1333-74-0P**, Hydrogen, uses
(removal of CO from methanol reforming gas by low temp. shift reaction)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST methanol reforming gas **fuel cell**; shift reaction
methanol reforming gas; **carbon monoxide** removal
methanol reforming gas
IT **Fuel cells**
(polymer electrolyte; removal of CO from methanol reforming gas by low temp. shift reaction)
IT Water gas shift reaction
Water gas shift reaction **catalysts**
(removal of CO from methanol reforming gas by low temp. shift reaction)
IT **7440-50-8**, Copper, uses
(Cu/Al2O3-ZnO; removal of CO from methanol reforming gas by low temp. shift reaction)
IT 1308-38-9, Chromium oxide cr2o3, uses 1309-48-4, Magnesia, uses
(**catalyst** support; removal of CO from methanol reforming gas by low temp. shift reaction)
IT **630-08-0, Carbon monoxide, processes**
(removal of **CO** from methanol reforming gas by low temp. shift reaction)
IT **1333-74-0P**, Hydrogen, uses
(removal of CO from methanol reforming gas by low temp. shift reaction)

L52 ANSWER 18 OF 27 HCA Cu + oxides
131:118387 **Catalytic** production of hydrogen from methanol for

fuel cell application. Sekizawa, K.; Utaka, T.;
Eguchi, K. (Department of Molecular and Materials Sciences, Graduate School of Engineering Sciences, Kyushu University, Kasuga, Fukuoka, 816-8580, Japan). Kinetics and Catalysis (Translation of Kinetika i Kataliz), 40(3), 411-413 (English) 1999. CODEN: KICAA8. ISSN: 0023-1584. Publisher: MAIK Nauka/Interperiodica Publishing.

AB Copper **catalysts** supported on mixed oxides were investigated in CO removal in the methanol steam reforming gas. It is difficult to remove a trace amt. of CO in the postreforming gas through a water-gas shift reaction due to the kinetic effect, although the high activity at low temps. is a thermodn. requirement. An addn. of a small amt. of **O2** to the postreforming gas is effective in enhancing CO removal via CO oxidn. The Cu/Al2O3-ZnO, Cu/Al2O3-Cr2O3, and Cu/Al2O3-MgO **catalysts** demonstrated high activities at 150.degree. in the presence of **O2**. The Cu/Al2O3-ZnO **catalyst** was the most active of these **catalysts**.

IT **7440-50-8**, Copper, uses
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, Hydrogen, preparation
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, processes
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^-C\equiv O^+$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST **carbon monoxide** removal steam reforming gas; methanol steam reforming **fuel cell**; water gas shift reaction **oxidn catalyst**

IT **Fuel cells**
Oxidation catalysts
Synthesis gas
Water gas shift reaction **catalysts**
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

IT 1308-38-9, Chromium oxide (Cr2O3), uses 1309-48-4, Magnesia, uses **7440-50-8**, Copper, uses
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

IT 67-56-1, Methanol, miscellaneous 1314-13-2, Zinc oxide, miscellaneous 1344-28-1, Alumina, miscellaneous
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

IT **1333-74-0P**, Hydrogen, preparation
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

IT **630-08-0**, **Carbon monoxide**, processes
(copper **catalysts** supported on mixed oxides for **carbon monoxide** removal from methanol steam reforming gas)

L52 ANSWER 19 OF 27 HCA COPYRIGHT 2003 ACS on STN

noble + rare earth

131:61183 **Catalyst** for **oxidation** of **carbon monoxide** in **hydrogen gas**, especially for **fuel cell**, its manufacture, and oxidation process.
Eto, Yoshiyuki; Kaneko, Hiroaki (Nissan Motor Co., Ltd., Japan).
Jpn. Kokai Tokkyo Koho JP 11165070 A2 19990622 Heisei, 11 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-332104 19971202.

AB The **catalyst** comprises Pt-group metal (e.g., Pd or Ru)-contg. base metal (e.g., Cu) rare earth metal (e.g., Ce or Nd) oxide dispersed in active Al2O3 on a ceramic support. The manuf. consists of adding a mix soln. of Pt-group metal salt, Cu salt, and rare earth metal salt to an octylic acid soln., firing the pptn. in **air** to prep. an oxide, mixing the oxide with active Al2O3 into a slurry, applying the slurry on a ceramic support, and firing in oxidizing atm. at 350-500.degree.. **CO** in **H gas** is oxidized (e.g., at 100-200.degree.) and removed. The purified **H gas** is suitable for fuel gas for a **fuel cell**.

IT **7440-50-8**, Copper, uses
(in manuf. of **catalyst** for **oxidn**. of **carbon monoxide** in **hydrogen gas** for **fuel cell**)

RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 1333-74-0P, Hydrogen, uses
(manuf. of catalyst for oxidn. of carbon monoxide in hydrogen gas for fuel cell)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT 630-08-0, Carbon monoxide, reactions
(manuf. of catalyst for oxidn. of carbon monoxide in hydrogen gas for fuel cell)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IC ICM B01J023-89
ICS B01D053-94; C01B003-58; C01B031-20; H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST carbon monoxide oxidn catalyst manuf; platinum copper rare earth oxide catalyst; palladium copper rare earth oxide catalyst; ruthenium copper rare earth oxide catalyst; cerium copper platinum group oxide catalyst; neodymium copper platinum group oxide catalyst; fuel cell hydrogen gas purifn catalyst
IT Fuel cells
Oxidation catalysts
(manuf. of catalyst for oxidn. of carbon monoxide in hydrogen gas for fuel cell)
IT Rare earth oxides
Rare earth oxides
(platinum-group metal compds., contg. base metal, catalyst; manuf. of catalyst for oxidn. of carbon monoxide in hydrogen gas for fuel cell)
IT Platinum-group metal compounds
Platinum-group metal compounds
(rare earth oxides, contg. base metal, catalyst; manuf. of catalyst for oxidn. of carbon monoxide in hydrogen gas for fuel cell)

IT 1344-28-1, Alumina, uses
(**catalyst** support; manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT 7440-05-3, Palladium, uses 7440-18-8, Ruthenium, uses
(**catalyst**; in manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT 228088-17-3P, Cerium copper oxide (Ce0.26Cu0.0603.64)
228088-21-9P, Cerium copper oxide (Ce0.28Cu0.0303.64)
228088-24-2P, Cerium copper oxide (Ce0.28Cu0.0303.65)
228088-26-4P, Copper neodymium oxide (Cu0.07Nd0.2603.58)
228088-28-6P, Copper neodymium oxide (Cu0.07Nd0.2603.59)
228088-31-1P, Copper neodymium oxide (Cu0.03Nd0.2803.58)
228088-32-2P, Copper neodymium oxide (Cu0.1Nd0.2403.65)
(**catalyst**; manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT **7440-50-8**, Copper, uses
(in manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT **1333-74-0P**, Hydrogen, uses
(manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT **630-08-0**, **Carbon monoxide**, reactions
(manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)
IT 3251-23-8 7647-10-1, Palladium chloride (PdCl2) 10045-95-1, Neodymium nitrate 10108-73-3, Cerium nitrate 13465-52-6, Ruthenium chloride (RuCl4) 17158-60-0, Sodium octylate
(prepn. of platinum-group metal-base metal-rare earth metal oxide as **catalyst**; manuf. of **catalyst** for **oxidn.** of **carbon monoxide** in **hydrogen gas** for **fuel cell**)

Au/Fe2O3

L52 ANSWER 20 OF 27 HCA COPYRIGHT 2003 ACS on STN
130:299256 Kinetics of the Selective Low-Temperature Oxidation of CO in **H2**-Rich Gas over Au/.alpha.-Fe2O3. Kahlich, M. J.; Gasteiger, H. A.; Behm, R. J. (Abteilung Oberflachenchemie und Katalyse, Universitat Ulm, Ulm, D-89069, Germany). Journal of Catalysis, 182(2), 430-440 (English) 1999. CODEN: JCTLA5. ISSN: 0021-9517. Publisher: Academic Press.
AB The selective CO oxidn. (also referred to as PROX) on a Au/.alpha.-Fe2O3 **catalyst** in simulated **reformer** gas (low concns. of CO and **O2**, 75 kPa **H2**, balance N2) at atm. pressure was investigated over almost two orders of magnitude in CO partial pressure (0.025-1.5 kPa) and over a large range of pO2/pCO ratios (0.25-10). Quant. evaluation of CO oxidn. rates as a function of CO and **O2** partial pressure at

80.degree.C yields reaction orders with respect to CO and **O2** of 0.55 and 0.27, resp. The apparent activation energy for this reaction evaluated in the temp. range of 40-100.degree.C is 31 kJ/mol. At 80.degree.C, the selectivity, defined as the ratio of oxygen consumption for CO oxidn. to the total oxygen consumption, reaches 75% at large CO partial pressures (1.5 kPa), but decreases significantly with diminishing pCO. This is related to the fact that the **H2** oxidn. rate is independent of the CO partial pressure, consistent with a reaction mechanism where oxygen adsorbed at the metal/metal oxide interface reacts with H and CO adsorbed at low coverages on the supported Au nanoclusters. The selectivity increases with decreasing temp., reflecting a higher apparent activation energy for **H2** oxidn. than for CO oxidn. A comparison with Pt/.gamma.-Al2O3, a commonly used PROX **catalyst** with an optimum operating temp. of ca. 200.degree.C, demonstrates that Au/.alpha.-Fe2O3 already offers comparable activity and selectivity at 80.degree.C. (c) 1999 Academic Press.

IT **1309-37-1**, Ferric oxide, processes **1333-74-0**, **Hydrogen**, **processes**
(kinetics of selective low-temp. oxidn. of **carbon monoxide** in **hydrogen**-rich **gas** over Au/.alpha.-Fe2O3)

RN 1309-37-1 HCA

CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, processes
(kinetics of selective low-temp. oxidn. of **carbon monoxide** in **hydrogen**-rich **gas** over Au/.alpha.-Fe2O3)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 67

ST **carbon monoxide oxidn catalyst**
; gold iron oxide **oxidn catalyst**; hydrogen
carbon monoxide oxidn **fuel cell**

IT **Fuel cells**
Oxidation catalysts
Oxidation kinetics
Reaction mechanism
(kinetics of selective low-temp. oxidn. of **carbon**

monoxide in **hydrogen**-rich **gas** over
Au/.alpha.-Fe2O3)
IT 7440-57-5, Gold, uses
(kinetics of selective low-temp. oxidn. of **carbon** **monoxide** in **hydrogen**-rich **gas** over
Au/.alpha.-Fe2O3)
IT **1309-37-1**, Ferric oxide, processes **1333-74-0**, **Hydrogen**, **processes**
(kinetics of selective low-temp. oxidn. of **carbon** **monoxide** in **hydrogen**-rich **gas** over
Au/.alpha.-Fe2O3)
IT **630-08-0**, **Carbon monoxide**, processes
(kinetics of selective low-temp. oxidn. of **carbon** **monoxide** in **hydrogen**-rich **gas** over
Au/.alpha.-Fe2O3)

Au/Fe2O3

L52 ANSWER 21 OF 27 HCA COPYRIGHT 2003 ACS on STN
129:163846 Preferential oxidation of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3: reactor design calculations and experimental results. Kahlich, M. J.; Gasteiger, H. A.; Behm, R. J. (Abteilung Oberflachenchemie und Katalyse, Universitat Ulm, Ulm, D-89069, Germany). Journal of New Materials for Electrochemical Systems, 1(1), 39-46 (English) 1998. CODEN: JMESFQ. ISSN: 1480-2422. Publisher: Journal of New Materials for Electrochemical Systems.

AB We present calcns. of the required oxygen excess and noble metal mass together with integral flow expts. for the preferential oxidn. (PROX) of CO in simulated **reformer gas** (1% **CO**, low concns. of **O2**, 75% **H2**, balance N2) over pt/.gamma.-Al2O3 at 200.degree. and Au/.alpha.-Fe2O3 at 80.degree. under different load conditions, i.e., at different contact times. The calcns. are based on kinetic data of both **catalysts** detd. in differential flow expts. It is demonstrated that these calcns. give realistic values for the min. noble metal mass and the oxygen excess required for a desired CO conversion. At optimum contact-time, the min. CO exit concn. on a Pt/.gamma.-Al2O3 **catalyst** at 200.degree. was found to be 60 ppm, increasing to 200 ppm at five-fold higher contact-time. This is attributed to the reverse water-gas shift reaction taking place as a competing reaction to the selective CO oxidn. over Pt/.gamma.-Al2O3. On a Au/.alpha.-Fe2O3 **catalyst**, the min. CO exit concn. of <3 ppm (detection limit) increases to 30 ppm by increasing the contact-time by a factor of five. A two-step PROX reactor using Pt/.gamma.-Al2O3 in a first stage at 200.degree. to oxidize the majority of CO down to .apprx.1000 ppm and Au/.alpha.-Fe2O3 in a second stage at 80.degree. is proposed for the complete oxidn. of CO under dynamic load conditions.

IT **1309-37-1**, Ferric oxide, uses
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IT **1333-74-0P**, Hydrogen, preparation
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

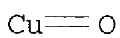
$^{-}C \equiv O^{+}$

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST **carbon monoxide oxidn** platinum alumina
catalyst; **reformer gas hydrogen**
purifn **fuel cell**; gold iron oxide
catalyst oxidn
IT **Reforming** apparatus
(gas from; reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
IT **Oxidation catalysts**
Water gas shift reaction
Water gas shift reaction **catalysts**
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
IT **1309-37-1**, Ferric oxide, uses 1344-28-1, Alumina, uses
7440-06-4, Platinum, uses 7440-57-5, Gold, uses
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
IT **1333-74-0P**, Hydrogen, preparation
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)
IT **630-08-0**, **Carbon monoxide**, reactions
(reactor design calcns. and exptl. results on preferential oxidn. of CO over Pt/.gamma.-Al2O3 and Au/.alpha.-Fe2O3)

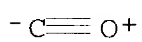
L52 ANSWER 22 OF 27 HCA COPYRIGHT 2003 ACS on STN no
125:63111 Ethanol steam **reforming** in a molten carbonate **fuel cell**. A preliminary kinetic investigation.
Cavallaro, S.; Freni, S. (Dip. Chim. Industriale, Univ. Messina, S. Agata di Messina, I-98166, Italy). International Journal of Hydrogen Energy, 21(6), 465-469 (English) 1996. CODEN: IJHEDX. ISSN: 0360-3199. Publisher: Elsevier.
AB The decompn. of EtOH to COx and **H2** was examd. under a wide

range of operating conditions. High pressure reduced **H_2**, CO and CO_2 prodn., while high temp. produced the opposite effect. At T<600 K, the reaction produced **oxygenated** compds. (acetaldehyde, Et acetate, acetic acid etc.) and **H_2** yield was reduced. A math. model was used to extrapolate the kinetic findings obtained in the microreactor at atm. pressure to ideal high pressure equipment. The simulation showed the feasibility of the process at temps. 800-1000 K, and pressures .gtoreq.100 bar. The use of a $CuO/ZnO/Al_2O_3$ **catalyst**, exhibited good activity, and more expensive **catalysts** were unnecessary.

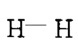
IT **1317-38-0**, Copper oxide (cuo), uses
    (ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
RN 1317-38-0 HCA
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, formation (nonpreparative)
    (ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)



IT **1333-74-0**, Hydrogen, uses
    (ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



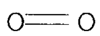
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **reforming** ethanol molten carbon **fuel cell**
IT **Reforming catalysts**
    (copper-zinc/alumina; ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT **Fuel cells**
    (molten carbonate; ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT Kinetics of **reforming**
    (steam, ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT 1314-13-2, Zinc oxide (zno), uses **1317-38-0**, Copper oxide (cuo), uses 1344-28-1, Aluminum oxide (Al_2O_3), uses

(ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT 124-38-9, Carbon dioxide, formation (nonpreparative) **630-08-0**, **Carbon monoxide**, formation (nonpreparative)
(ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT **1333-74-0**, Hydrogen, uses
(ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)
IT 64-17-5, Ethanol, uses
(ethanol steam **reforming** kinetics in molten carbonate **fuel cells**)

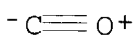
L52 ANSWER 23 OF 27 HCA Viewed - has Au
124:207257 Oxidation of CO to CO2 and manufacture of **hydrogen** -containing **gases** for **fuel cells**.
Fujimoto, Tatsuya (Idemitsu Kosan Co, Japan). Jpn. Kokai Tokkyo Koho JP 07315825 A2 19951205 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-105735 19940519.
AB CO is converted into CO2 by selective oxidn. by contacting a **gas** mixt. contg. **CO**, O, and .ltoreq.3 vol% impurities of methanol, formic acid, and/or formaldehyde with a noble metal **catalysts** (e.g., Au). The **CO**-contg. **gases** may be obtained by **reforming** of methanol. The **H**-contg. **gas** for **fuel cells** is manufd. by contacting a gas product from methanol **reforming** with noble metal **catalysts** for selective removal of CO by oxidn. of CO to CO2.
IT **1309-37-1**, Ferric oxide, uses
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn.** for **fuel cells**)
RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
IT **1333-74-0**, **Hydrogen**, **processes**
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn.** for **fuel cells**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H— H

IT **7782-44-7**, Oxygen, reactions
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn.** for **fuel cells**)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, processes
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)



IC ICM C01B031-20
ICS B01J023-89; C01B003-32; C01B003-58; H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **carbon monoxide** converting **oxidn catalyst**; hydrogen manuf **fuel cell**
IT **Fuel cells**
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT Transition metals, uses
(nobel; converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT **Oxidation catalysts**
(noble metals; converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT **1309-37-1**, Ferric oxide, uses 7440-57-5, Gold, uses
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT **1333-74-0**, **Hydrogen**, **processes**
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT 124-38-9P, Carbon dioxide, preparation
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT **7782-44-7**, Oxygen, reactions
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)
IT **630-08-0**, **Carbon monoxide**, processes
(converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic**

oxidn. for **fuel cells**)

IT 64-18-6, Formic acid, miscellaneous 67-56-1, Methanol, miscellaneous
(impurity; converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)

IT 50-00-0, Formaldehyde, occurrence
(impurity; converting of **carbon monoxide** in hydrogen from methanol **reforming** by selective **catalytic oxidn**. for **fuel cells**)

L52 ANSWER 24 OF 27 HCA COPYRIGHT 2003 ACS on STN viewed has Au

124:150607 Manufacture of **hydrogen**-containing **gas** for **fuel cells**. Fujimoto, Tatsuya (Idemitsu Kosan Co, Japan). Jpn. Kokai Tokkyo Koho JP 07309603 A2 19951128 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-103075 19940517.

AB In manuf. of the title **H**-contg. **gases** by **catalytic oxidative** conversion of CO to CO2 in mixts. of **O**-contg. **gases** and **reformed gas** mainly contg. **CO** and CO2, the selective oxidn. process is controlled to keep the concns. of O and **CO** in exhaust **gas** to .gtoreq.0.2 and <2 vol.% and .ltoreq.100 ppm, resp.

IT **1309-37-1**, Iron oxide (fe2o3), uses
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn**. of **reformed gas** and **O**-contg. **gases**)

RN 1309-37-1 HCA

CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IT **1333-74-0P**, Hydrogen, uses
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn**. of **reformed gas** and **O**-contg. **gases**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, reactions
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn**. of **reformed gas** and **O**-contg. **gases**)

RN 630-08-0 HCA

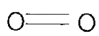
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$-C\equiv O^+$

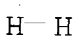
IC ICM C01B003-50
ICS C01B003-38; C01B031-20; H01M008-06
CC 51-6 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 52, 67
ST **hydrogen** contg **gas** manuf; **catalytic oxidn reformed** gas; **fuel cell hydrogen gas** manuf
IT **Fuel cells**
Fuel gas manufacturing
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn** . of **reformed gas** and **O**-contg. **gases**)
IT **1309-37-1**, Iron oxide (fe2o3), uses 7440-57-5, Gold, uses
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn** . of **reformed gas** and **O**-contg. **gases**)
IT 124-38-9P, Carbon dioxide, uses **1333-74-0P**, Hydrogen, uses
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn** . of **reformed gas** and **O**-contg. **gases**)
IT **630-08-0**, **Carbon monoxide**, reactions
(manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn** . of **reformed gas** and **O**-contg. **gases**)
IT 1344-28-1, Alumina, uses
(support; manuf. of **hydrogen**-contg. **gases** for **fuel cells** by **catalytic oxidn** . of **reformed gas** and **O**-contg. **gases**)

L52 ANSWER 25 OF 27 HCA COPYRIGHT 2003 ACS on STN Av
122:270131 Manufacture of **hydrogen**-containing **gases** for **fuel cells**. Kesen, Tadashi; Takase, Tsuneyoshi; Matsuhisa, Toshio; Iida, Hiroshi (Idemitsu Kosan Co, Japan; Toyo Cci Kk). Jpn. Kokai Tokkyo Koho JP 07048101 A2 19950221 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-208195 19930802.
AB In manuf. of the title gases by selective oxidn. removal of CO from mixt. of **O**-contg. **gas** and **CO**-contg. **H**-based **gas**, obtained by **reforming** of fuels that are convertible into **H**-contg. fuel **gas** ; the **CO** removal **process** is carried out in presence of Au-contg. **catalyst** at .gtoreq.2 kg/cm2G and <10 kg/cm2G. The gases show high performance when used in

fuel cells.
IT **1309-37-1**, Iron oxide (fe2o3), uses
(manuf. of **H**-contg. **gases** for **fuel cells** by selective oxidn. of CO using gold **catalyst**)
RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
IT **7782-44-7**, Oxygen, uses
(manuf. of **H**-contg. **gases** for **fuel cells** by selective oxidn. of CO using gold **catalyst**)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)



IT **1333-74-0P**, Hydrogen, uses
(manuf. of **H**-contg. **gases** for **fuel cells** by selective oxidn. of CO using gold **catalyst**)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, reactions
(manuf. of **H**-contg. **gases** for **fuel cells** by selective oxidn. of CO using gold **catalyst**)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

IC ICM C01B003-38
ICS B01D053-94; B01J023-89; B01J035-02; H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 51, 67
ST **hydrogen gas** manuf **fuel cell**; **carbon monoxide catalytic oxidn** gas; gold **catalyst carbon monoxide oxidn**
IT **Fuel cells**
(gases for; manuf. of **H**-contg. **gases** for **fuel cells** by selective oxidn. of CO using gold **catalyst**)
IT Hydrocarbon oils
(light; manuf. of **H**-contg. **gases** for

fuel cells by selective oxidn. of CO using gold
catalyst)

IT Fuel **gases**
Oxidation catalysts
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT Alcohols, **processes**
Kerosine
Naphtha
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT Natural gas
(liquefied, manuf. of **H**-contg. **gases** for
fuel cells by selective oxidn. of CO using gold
catalyst)

IT 74-98-6, Propane, processes
(liquefied; manuf. of **H**-contg. **gases** for
fuel cells by selective oxidn. of CO using gold
catalyst)

IT **1309-37-1**, Iron oxide (fe2o3), uses 1344-28-1, Alumina,
uses 7440-57-5, Gold, uses
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT **7782-44-7**, Oxygen, uses
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT 67-56-1, Methanol, **processes** 74-82-8, Methane,
processes 106-97-8, Butane, **processes**
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT **1333-74-0P**, Hydrogen, uses
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

IT **630-08-0**, **Carbon monoxide**, reactions
(manuf. of **H**-contg. **gases** for **fuel**
cells by selective oxidn. of CO using gold
catalyst)

L52 ANSWER 26 OF 27 HCA

57:16050 Original Reference No. 57:3180i,3181a-e High-temperature
carbonate **fuel cells**. Broers, G. H. J.;
Ketelaar, J. A. A. Journal of Industrial and Engineering Chemistry
(Washington, D. C.), 52, 303-6 (Unavailable) 1960. CODEN: JIECAD.
ISSN: 0095-9014.

AB The properties of electrolytes based on monazite, WO3, Na2CO3, and
soda glass in the proportions used by Davtyan, and of other molten

electrolytes are reviewed. Electrolytes comprising Li, Na, and (or) K carbonates were supported in porous sintered MgO disks which are first presintered at 1200.degree.. The electrolyte-impregnated disk is covered on both sides with electrodes consisting of thin layers of metal powders prepd. by redn. of the oxides in **H** or **Co atms**. at temps. slightly above the cell operating temp. Elec. contact is made with Ag, Fe, or Ni wire gauze. Supporting manifolds delivering fuel and oxidizing gas are elec. insulated with mica and asbestos gaskets. Cells of this type ran continuously for several months between 550 and 700.degree. on town **gas**, **H**, **CO**, and natural **gas**. The best cell had a life of 6 months on town gas and **air** contg. CO2. Opencircuit e.m.f. initially 1.1 v. decayed to 0.90 v. and cell resistance increased from an original 0.3 to 1.5 ohms. Cell deterioration was caused by vaporization of alkali oxides and CO2 and by reaction of the melt with the gasketing. "Drowning" of the electrodes, and electrode deterioration were not factors in the fall of cell output since the MgO disk could be reimpregnated to reproduce, with the same unimproved electrodes, cell performance characteristic of the original cell. Fifty ma./sq. cm. at 0.7 to 0.8 v. were obtained with 50% H and H2O on Ni and **air** and CO2 on Ag electrodes at 600-650.degree.. At 770.degree. 70% CH4 and 30% H2O yield 0, 20, 40, and 60 ma./sq. cm. at 0.98, 0.80, 0.63, and 0.50 v., resp. Ag is an ideal nonpolarizing O cathode in carbonate melts above 500.degree.. The O cathode shows reduced polarization when CO2 is added to the **O stream**. This fact supports the CO3-- mechanism of O transport. The **catalytic** activity of various metals in the anodic oxidn. of CO at 700.degree. was found to be in decreasing order: Pt, platinized Fe or Ni, Fe, Ni, Co, Cu, Cr, and Mn. Electrode particle size influences the results. No satisfactory electrode metal was found for the anodic oxidn. of CH4 below 750.degree.. When steam is added to the CH4, Ni anodes appear suitable.

IT **7440-48-4**, Cobalt
(anodes, **catalysis** of fuel gas oxidn. by, in **fuel cells**)

RN 7440-48-4 HCA

CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **7440-50-8**, Copper
(anodes, fuel gas **oxidn. catalysis** by, in **fuel cells**)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0**, Hydrogen

(**fuel cells** with O, with alkali metal
carbonate electrolyte)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen
(**fuel cells**, Ag cathodes for)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

(**fuel cells**, with alkali metal carbonate
electrolytes
CC 22 (Electrochemistry)
IT Gas, **fuel** (manufactured)
Gas, natural
(**fuel cells** using, with alkali metal
carbonate electrolytes)
IT Alkali metal carbonates
Alkali metal carbonates
(**fuel cells** with electrolytes from fused)
IT **Cells**, voltaic
Cells, voltaic
(**fuel**, with alkali metal carbonate electrolytes)
IT Anodes and(or) Positive electrodes
(**fuel-cell**, as **fuel**-gas
oxidn. **catalyst**)
IT **Catalysts** and **Catalysis**
(in **oxidn.**, of CO and CH4 in **fuel**
cells, anodes as)
IT **Air**
(mixts. with CO2, **fuel cells** using, with
alkali metal carbonate electrolytes)
IT Potential, electric
(of **fuel cells**, with alkali metal carbonate
electrolytes)
IT Polarization (electrolytic)
(of silver in for O in **fuel cells** with alkali
metal carbonate electrolytes, cathodic)
IT Cathodes and(or) Negative electrodes
(silver, for O in **fuel cells**)
IT Particles
(size of, of anodes in **fuel cells**,
fuel gas **oxidn.** **catalysis** and)
IT Iron, oxygen in
(and platinum-coated Fe, anodes, fuel gas **oxidn.**
catalysis by, in **fuel cells**)

IT **Carbon monoxide**, dimethyl mercaptole
Carbon monoxide, dimethyl mercaptole
(**fuel cells** using, with alkali metal
carbonate electrolytes)

IT 7440-02-0, Nickel
(and platinum-coated Ni, anodes, fuel gas **oxidn.**
catalysis by, in **fuel cells**)

IT **7440-48-4**, Cobalt
(anodes, **catalysis** of fuel gas oxidn. by, in
fuel cells)

IT **7440-50-8**, Copper
(anodes, fuel gas **oxidn. catalysis** by, in
fuel cells)

IT 7440-47-3, Chromium
(anodes, fuel-gas **oxidn. catalysis** with, in
fuel cells)

IT 7439-96-5, Manganese
(**catalysts**, in **oxidn.** of fuel gas in
fuel cells)

IT 7440-22-4, Silver
(cathodes (**fuel-cell**) from O and)

IT 124-38-9, Carbon dioxide
(**fuel cells** from **air** alkali metal
carbonate electrolytes and)

IT **1333-74-0**, Hydrogen
(**fuel cells** with O, with alkali metal
carbonate electrolyte)

IT 1309-48-4, Magnesium oxide
(**fuel cells** with alkali metal carbonate
electrolytes and)

IT 497-19-8, Sodium carbonate 554-13-2, Lithium carbonate 584-08-7,
Potassium carbonate
(**fuel cells** with electrolytes contg.)

IT **7782-44-7**, Oxygen
(**fuel cells**, Ag cathodes for)

IT 74-82-8, Methane **7782-44-7**, Oxygen
(**fuel cells**, with alkali metal carbonate
electrolytes)

L52 ANSWER 27 OF 27 HCA COPYRIGHT 2003 ACS on STN
57:16049 Original Reference No. 57:3180i,3181a-e High-temperature
carbonate **fuel cells**. Broers, G. H. J.;
Ketelaar, J. A. A. (Central Tech. Inst. T.M.O., Hague, Neth.). Fuel
Cells, Symposium, Atlantic City, 1959, 78-93 (Unavailable) 1960.

AB The properties of electrolytes based on monazite, WO3, Na2CO3, and
soda glass in the proportions used by Davtyan, and of other molten
electrolytes are reviewed. Electrolytes comprising Li, Na, and (or)
K carbonates were supported in porous sintered MgO disks which are
first presintered at 1200.degree.. The electrolyte-impregnated disk
is covered on both sides with electrodes consisting of thin layers
of metal powders prepd. by redn. of the oxides in **H** or
Co atms. at temps. slightly above the cell

operating temp. Elec. contact is made with Ag, Fe, or Ni wire gauze. Supporting manifolds delivering fuel and oxidizing gas are elec. insulated with mica and asbestos gaskets. Cells of this type ran continuously for several months between 550 and 700.degree. on town **gas**, **H**, **CO**, and natural **gas**.
The best cell had a life of 6 months on town gas and **air** contg. CO2. Opencircuit e.m.f. initially 1.1 v. decayed to 0.90 v. and cell resistance increased from an original 0.3 to 1.5 ohms. Cell deterioration was caused by vaporization of alkali oxides and CO2 and by reaction of the melt with the gasketing. "Drowning" of the electrodes, and electrode deterioration were not factors in the fall of cell output since the MgO disk could be reimpregnated to reproduce, with the same unimproved electrodes, cell performance characteristic of the original cell. Fifty ma./sq. cm. at 0.7 to 0.8 v. were obtained with 50% H and H2O on Ni and **air** and CO2 on Ag electrodes at 600-650.degree.. At 770.degree. 70% CH4 and 30% H2O yield 0, 20, 40, and 60 ma./sq. cm. at 0.98, 0.80, 0.63, and 0.50 v., resp. Ag is an ideal nonpolarizing O cathode in carbonate melts above 500.degree.. The O cathode shows reduced polarization when CO2 is added to the **O stream**. This fact supports the CO3-- mechanism of O transport. The **catalytic** activity of various metals in the anodic oxidn. of CO at 700.degree. was found to be in decreasing order: Pt, platinized Fe or Ni, Fe, Ni, Co, Cu, Cr, and Mn. Electrode particle size influences the results. No satisfactory electrode metal was found for the anodic oxidn. of CH4 below 750.degree.. When steam is added to the CH4, Ni anodes appear suitable.

IT **7440-48-4**, Cobalt
(anodes, **catalysis** of fuel gas oxidn. by, in **fuel cells**)
RN 7440-48-4 HCA
CN Cobalt (8CI, 9CI) (CA INDEX NAME)

Co

IT **7440-50-8**, Copper
(anodes, fuel gas **oxidn.** **catalysis** by, in **fuel cells**)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0**, Hydrogen
(**fuel cells** with O, with alkali metal carbonate electrolyte)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **7782-44-7**, Oxygen
(**fuel cells**, Ag cathodes for)
RN 7782-44-7 HCA
CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

(**fuel cells**, with alkali metal carbonate
electrolytes
CC 22 (Electrochemistry)
IT Gas, **fuel** (manufactured)
Gas, natural
(**fuel cells** using, with alkali metal
carbonate electrolytes)
IT Alkali metal carbonates
Alkali metal carbonates
(**fuel cells** with electrolytes from fused)
IT **Cells**, voltaic
Cells, voltaic
(**fuel**, with alkali metal carbonate electrolytes)
IT Anodes and(or) Positive electrodes
(**fuel-cell**, as **fuel**-gas
oxidn. catalyst)
IT **Catalysts** and **Catalysis**
(in **oxidn.**, of CO and CH_4 in **fuel
cells**, anodes as)
IT **Air**
(mixts. with CO_2, **fuel cells** using, with
alkali metal carbonate electrolytes)
IT Potential, electric
(of **fuel cells**, with alkali metal carbonate
electrolytes)
IT Polarization (electrolytic)
(of silver in for O in **fuel cells** with alkali
metal carbonate electrolytes, cathodic)
IT Cathodes and(or) Negative electrodes
(silver, for O in **fuel cells**)
IT Particles
(size of, of anodes in **fuel cells**,
fuel gas **oxidn. catalysis** and)
IT Iron, oxygen in
(and platinum-coated Fe, anodes, fuel gas **oxidn.
catalysis** by, in **fuel cells**)
IT **Carbon monoxide**, dimethyl mercaptole
Carbon monoxide, dimethyl mercaptole
(**fuel cells** using, with alkali metal
carbonate electrolytes)

IT 7440-02-0, Nickel
(and platinum-coated Ni, anodes, fuel gas **oxidn.** **catalysis** by, in **fuel cells**)
IT **7440-48-4**, Cobalt
(anodes, **catalysis** of fuel gas oxidn. by, in **fuel cells**)
IT **7440-50-8**, Copper
(anodes, fuel gas **oxidn**. **catalysis** by, in **fuel cells**)
IT 7440-47-3, Chromium
(anodes, fuel-gas **oxidn**. **catalysis** with, in **fuel cells**)
IT 7439-96-5, Manganese
(**catalysts**, in **oxidn**. of fuel gas in **fuel cells**)
IT 7440-22-4, Silver
(cathodes (**fuel-cell**) from O and)
IT 124-38-9, Carbon dioxide
(**fuel cells** from **air** alkali metal carbonate electrolytes and)
IT **1333-74-0**, Hydrogen
(**fuel cells** with O, with alkali metal carbonate electrolyte)
IT 1309-48-4, Magnesium oxide
(**fuel cells** with alkali metal carbonate electrolytes and)
IT 497-19-8, Sodium carbonate 554-13-2, Lithium carbonate 584-08-7, Potassium carbonate
(**fuel cells** with electrolytes contg.)
IT **7782-44-7**, Oxygen
(**fuel cells**, Ag cathodes for)
IT 74-82-8, Methane **7782-44-7**, Oxygen
(**fuel cells**, with alkali metal carbonate electrolytes)

=> d l53 1-8 cbib abs hitstr hitind

L53 ANSWER 1 OF 8 HCA COPYRIGHT 2003 ACS on STN BD
138:371764 Process for producing **hydrogen**-containing **gas** by methanol steam **reforming**. Hirose, Shigeyuki; Ikoma, Futoshi; Katagiri, Masayuki; Takamura, Koki; Hiramatsu, Yasushi; Yoneoka, Mikio (Mitsubishi Gas Chemical Company, Inc., Japan). Eur. Pat. Appl. EP 1312412 A2 20030521, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, ~~FR, GB~~, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2002-25358 20021114. PRIORITY: JP 2001-354729 20011120; JP 2001-357304 20011122; JP 2001-362284 20011128.
AB There is disclosed a process for producing a **hydrogen** -contg. **gas**, which comprises reacting methanol, steam and oxygen in the presence of a **catalyst** comprising platinum

and zinc oxide, wherein the content of the platinum is in the range of 5-50% by wt. based on the total amt. of the platinum and zinc oxide, or a **catalyst** comprising platinum, zinc oxide and chromium oxide, wherein the at. ratio of zinc to chromium is in the range of 2 to 30, or a **catalyst** comprising platinum, zinc oxide and at least one element selected from the group consisting of lead, bismuth and indium. Each of the **catalysts** has a high activity and is excellent in heat resistance and selectivity to steam-**reforming** reaction, and accordingly is capable of efficiently producing a **reformed** gas which is composed principally of hydrogen and is well suited for use in a **fuel cell** and the like by means of auto thermal reaction reaction, while lowering the concn. of **carbon monoxide** in a **reformed hydrogen**-contg. **gas**.

IT **7440-50-8**, Copper, uses
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **7782-44-7**, **Oxygen**, **processes**
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O=O

IT **1333-74-0P**, **Hydrogen**, uses
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

RN 1333-74-0 HCA

CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H-H

IC ICM B01J023-60
ICS B01J023-652; B01J023-62; B01J023-644

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 67

ST **hydrogen** contg **gas** manuf methanol steam **reforming**; **fuel cell hydrogen** contg **gas** manuf methanol steam **reforming**; **catalyst** steam **reforming** methanol **hydrogen** contg **gas** manuf

IT Reactors

(auto-thermal; **process** for producing **hydrogen** -contg. **gas** by methanol steam **reforming**)

IT **Fuel cells**
Honeycomb structures
Steam **reforming catalysts**
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

IT Fuel gas manufacturing
(steam **reforming**; **process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

IT 1314-13-2, Zinc oxide (ZnO), uses 1344-28-1, Alumina, uses 7439-92-1, Lead, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses **7440-50-8**, Copper, uses 7440-69-9, Bismuth, uses 7440-74-6, Indium, uses 11118-57-3, Chromium oxide
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

IT 67-56-1, Methanol, processes **7782-44-7**, **Oxygen**, **processes**
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

IT **1333-74-0P**, **Hydrogen**, uses
(**process** for producing **hydrogen**-contg. **gas** by methanol steam **reforming**)

IT 1302-88-1, Cordierite
(support; **process** for producing **hydrogen** -contg. **gas** by methanol steam **reforming**)

L53 ANSWER 2 OF 8 HCA COPYRIGHT 2003 ACS on STN No
138:139936 Methanol steam **reforming** over Cu/SiC **catalysts**. Tomoda, Akihiko; Mikami, Daisuke; Azuma, Naoto; Ueno, Akifumi (R7D, FCC. Co., Ltd., Hosoe, Inasa, Shizuoka, 431-1304, Japan). Journal of Advanced Science, 13(3), 414-417 (English) 2001. CODEN: JAVSEQ. ISSN: 0915-5651. Publisher: Society of Advanced Science.

AB MeOH steam **reforming** reaction using Cu on SiC as **catalyst** was studied for the prodn. of H for **fuel cells**. **Catalytic** performance (activities, amt. H produced, and concn. of CO) were dependent on the calcination temp. of the **catalyst**. Calcination at <1073 K in **air** leads to an amorphous SiO_2 layer on the surface of the **catalyst** which stabilizes Cu active sites against sintering during reactions.

IT **7440-50-8**, Copper, uses
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)

RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 630-08-0, **Carbon monoxide**, formation (nonpreparative)
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^-C\equiv O^+$

IT **1333-74-0P**, Hydrogen, preparation
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67
ST methanol steam **reforming** copper silicon carbide **catalyst** hydrogen prodn
IT Steam **reforming catalysts**
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
IT 409-21-2, Silicon carbide (SiC), uses
(**catalyst** support; methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
IT **7440-50-8**, Copper, uses
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
IT 67-56-1, Methanol, processes
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
IT **630-08-0**, **Carbon monoxide**, formation (nonpreparative)
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)
IT **1333-74-0P**, Hydrogen, preparation
(methanol steam **reforming** over copper/silicon carbide **catalysts** for hydrogen prodn.)

L53 ANSWER 3 OF 8 HCA COPYRIGHT 2003 ACS on STN NO
137:374279 Method of treating atmospheric pollutants. Morgan, Christopher (Johnson Matthey Public Limited Company, UK). PCT Int. Appl. WO 2002092197 A1 20021121, 24 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,

SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-GB2139 20020515. PRIORITY: GB 2001-11801 20010515.

AB Atm. oxidizing pollutants such as O3, NO2, N2O4, and SO3 are removed by redox reaction using reducing agents supported on .gtoreq.1 of alumina, ceria, silica, titania, zirconia, or other minerals having large surface area and/or atm. reducing pollutants (e.g. hydrocarbons) trapped on .gtoreq.1 zeolites and other aluminosilicate minerals. The reducing agent comprises a mixt. of CuO and ZnO supported on alumina. The app. is utilized by engines fueled by gasoline, diesel, liq. petroleum gas, natural gas, methanol, ethanol, methane, or a mixt. of .gtoreq.2 of those, by elec. cells, solar cells, and by hydrocarbon or hydrogen-powered **fuel cells**.

IT **630-08-0, Carbon monoxide**, uses
1309-37-1, Iron oxide (Fe2O3), uses **1317-38-0**,
Copper oxide, uses
(atm. pollutant removal by redox reaction)

RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
RN 1317-38-0 HCA
CN Copper oxide (CuO) (8CI, 9CI) (CA INDEX NAME)

$Cu=O$

IC ICM B01D053-60
ICS B01D053-66; B01D053-86; B01J023-80; B01J023-72
CC 59-3 (Air Pollution and Industrial Hygiene)
ST reducing agent compn **air** pollutant removal redox reaction
IT Diesel engines
Electrolytic cells
Exhaust gas **catalytic** converters
Particles
Radiators
Solar cells
Soot
(atm. pollutant removal by redox reaction)
IT Engines
(**hydrogen**-fueled; **atm**. pollutant removal by redox reaction)
IT **630-08-0, Carbon monoxide**, uses

1306-38-3, Cerium oxide (CeO_2), uses **1309-37-1**, Iron oxide (Fe_2O_3), uses 1314-13-2, Zinc oxide (ZnO), uses 1314-23-4, Zirconium oxide (ZrO_2), uses **1317-38-0**, Copper oxide, uses 1344-28-1, Aluminum oxide (Al_2O_3), uses 7446-09-5, Sulfur dioxide, uses 7631-86-9, Silica, uses 7784-30-7, Phosphoric acid, aluminum salt (1:1) 9002-89-5, Polyvinyl alcohol 9004-64-2, Cellulose, 2-hydroxypropyl ether 9004-67-5, Cellulose, methyl ether 13463-67-7, Titanium oxide (TiO_2), uses 28805-15-4, Ammonium polymethacrylate
(atm. pollutant removal by redox reaction)

L53 ANSWER 4 OF 8 HCA COPYRIGHT 2003 ACS on STN BD
137:250326 Combined power/heat plant for **fuel cells** with **fuel** gas manufacturing by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal. Baumann, Frank; Wieland, Stefan; Britz, Peter; Heikrodt, Klaus (OMG AG & Co. KG, Germany). Eur. Pat. Appl. EP 1246286 A1 20021002, 8 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (German). CODEN: EPXXDW. APPLICATION: EP 2001-108230 20010331.

AB A combined power/heat assembly with integrated gas generation system comprises a gas burner-heated steam **reformer** which produces a **H2**-, and **CO**-contg. **reformate gas** flow from a methane/steam mixt. Then the **reformate** gas flow is cooled in a heat exchanger and fed into a low temp. shift reactor and thereafter in a methanation reactor for the removal of CO. The purified fuel gas is supplied into the **fuel cell** assembly for the prodn. of elec. power by **catalytic** conversion of the **H2** from the **reformate** with O2, whereby the **reformate** gas flow is fed to the anodes of the **fuel cell** and the anode waste gas is withdrawn and used for operating the gas burner. The **reformate** gas has a methane content of 5-10 vol.% which enables the detection of the gas burner flame with an ionization detector during the combustion of the anode waste gas in the gas burner. The low temp. shift reactor contains a Cu/ZnO-shift **catalyst** and the methanation reactor a Ru **catalyst**. The **fuel cells** with pre-switched gas generation system are suitable for supplying buildings with current and heat a so called combined power/heat plant.

IT **7440-50-8**, Copper, uses
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, Hydrogen, uses
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, processes
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for removal of)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IC ICM H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel gas manufg methane steam **reforming**; anode gas purifn **fuel cell**; water gas shift reaction **carbon monoxide** removal; **reformate** gas methanation **carbon monoxide** removal
IT Methanation
Water gas shift reaction
Water gas shift reaction **catalysts**
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT Fuel gas manufacturing
(purifn.; combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT Fuel gas manufacturing
(steam **reforming**, app.; in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT Fuel gas manufacturing
(steam **reforming**; in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT **Fuel cells**
(with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for

carbon monoxide removal)
IT 1314-13-2, Zinc oxide, uses 7440-18-8, Ruthenium, uses
7440-50-8, Copper, uses
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT **1333-74-0P**, Hydrogen, uses
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT 74-82-8, Methane, uses
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for **carbon monoxide** removal)
IT **630-08-0**, **Carbon monoxide**, processes
(combined power/heat plant for **fuel cells** with **fuel** gas manufg. by steam **reforming** in combination with water gas shift reaction and methanation for removal of)

L53 ANSWER 5 OF 8 HCA COPYRIGHT 2003 ACS on STN BD
137:219423 Development of residential PEFC **co**-generation/fuel **processor**. Ukai, Kunihiro; Taguchi, Kiyoshi; Tomizawa, Takeshi; Fujihara, Seiji (Living Environmental Development Center, Matsushita Electric Industrial Co., Ltd., Yagumonakamachi, Moriguchi-shi, Osaka, 570-8501, Japan). Enerugi, Shigen, 23(1), 68-71 (Japanese) 2002. CODEN: ENESEB. ISSN: 0285-0494. Publisher: Enerugi Shigen Gakkai.
AB Development of a residential polymer electrolyte **fuel cell** (PEFC) cogeneration system with **H2** generators using **air** durable **catalysts** is described.
IT **7440-50-8**, Copper, uses
(fuel processor development for residential PEFC co-generation)
RN 7440-50-8 HCA
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **1333-74-0P**, **Hydrogen**, uses
(fuel **processor** development for residential PEFC co-generation)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell reforming catalyst**
residential cogeneration
IT **Reforming catalysts**
(fuel processor development for residential PEFC co-generation)
IT **Fuel cells**
(polymer electrolyte; **fuel** processor development for residential PEFC co-generation)
IT Fuel gas manufacturing
(**reforming**; fuel processor development for residential PEFC co-generation)
IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses
7440-50-8, Copper, uses 7440-66-6, Zinc, uses
(fuel processor development for residential PEFC co-generation)
IT **1333-74-0P**, **Hydrogen**, uses
(fuel **processor** development for residential PEFC co-generation)

L53 ANSWER 6 OF 8 HCA COPYRIGHT 2003 ACS on STN BD
136:311739 Filters contg. pollutant-purification **catalysts**, **air** purification apparatus and other commodities employing the filters or **catalysts**. Suzuki, Kenichiro; Sofugawa, Hideo; Tanabe, Toshiki; Sasaki, Megumi; Morikawa, Akira; Hayashi, Hiroaki; Sugiura, Masato (Toyota Central Research and Development Laboratories, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2002119809 A2 20020423, 18 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-315617 20001016.
AB The filters comprise **air**-permeable main bodies, and precious metal **catalysts** loaded on oxide supports; wherein the oxides have been previously redn. **treated** to generate **oxygen** deficiency. **Air** purifn. app., **air** conditioning app., humidifiers, and combustion-type heaters employ the filters. Also claimed are elec. fans, deodorants, rubber eraser compns., resin compns., spraying app., construction wall materials, fiber articles, paper articles, curtains, masks, shoes insoles, toilet stools, polymer-electrolyte **fuel cells**, CO2-contg. gas laser app., and water-decompn. app. in combination with ultrasonic wave irradn. for generating **H2**, each of them contg. the loaded **catalysts**. The **catalysts** are capable of purifying pollutants, such as CO, formaldehyde, malodor substances, etc. at ordinary temp.
IT **1309-37-1D**, Iron oxide (fe2o3), oxygen-deficient, uses
(**catalyst** supports; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)
RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
IT **1333-74-0P**, Hydrogen, preparation
(**catalytic** decompn. of water for manuf. of; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **630-08-0**, **Carbon monoxide**, processes
(pollutant; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C \equiv O^{+}$

IC ICM B01D039-14
ICS A61L002-16; A61L009-00; A61L009-16; B01D053-86; B01J023-42; B01J023-63; B01J023-89; C01B003-04; C08L021-00; C08L101-00; D06M011-45; F24F001-00; F24F007-00; H01M008-06; H01M008-10
CC 47-2 (Apparatus and Plant Equipment)
Section cross-reference(s): 38, 49, 52, 59, 63, 67
ST purifn filter **catalyst** support oxygen deficient oxide; pollutant purifn filter **catalyst** support oxide; **carbon monoxide** purifn **catalyst** support oxide; acetaldehyde purifn **catalyst** support oxide; formaldehyde purifn **catalyst** support oxide; **air** purifier filter filter **catalyst** support oxide; conditioner **air** filter **catalyst** support oxide; combustion heater filter **catalyst** support oxide; elec fan pollutant purifn **catalyst** support oxide; deodorant pollutant purifn **catalyst** support oxide; correction ink pollutant purifn **catalyst** support oxide; rubber eraser pollutant purifn **catalyst** support oxide; polymer pollutant purifn **catalyst** support oxide; spraying app pollutant purifn **catalyst** support oxide; construction wall pollutant purifn **catalyst** support oxide; fiber article pollutant purifn **catalyst** support oxide; paper article pollutant purifn **catalyst** support oxide; curtain pollutant purifn **catalyst** support oxide; face mask pollutant purifn **catalyst** support oxide; shoe insole pollutant purifn **catalyst** support oxide; toilet pollutant purifn **catalyst** support oxide; **fuel cell** pollutant purifn **catalyst** support oxide; gas laser pollutant purifn **catalyst** support oxide; water decompn app hydrogen manuf **catalyst** support
IT Inks
(correction; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)
IT Household furnishings
(curtains; pollutant-purifn. **catalysts** loaded on

oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT Materials
(erasers, rubber; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT Rubber, uses
(erasers; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT Medical goods
(face masks, sanitary; pollutant-purifn. **catalysts**
loaded on oxygen-deficient oxide supports for filters,
air purifn. app., and other commodities)

IT **Air** conditioners
(humidifiers; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT Shoes
(insoles; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT **Air** conditioners
Air purification apparatus
Deodorants
Filters
Gas lasers
Spraying apparatus
Walls (construction)
(pollutant-purifn. **catalysts** loaded on oxygen-deficient
oxide supports for filters, **air** purifn. app., and other
commodities)

IT Fibers
Polymers, uses
(pollutant-purifn. **catalysts** loaded on oxygen-deficient
oxide supports for filters, **air** purifn. app., and other
commodities)

IT Solid state **fuel cells**
(polymer electrolyte; pollutant-purifn. **catalysts**
loaded on oxygen-deficient oxide supports for filters,
air purifn. app., and other commodities)

IT **Catalysts**
(purifn.; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT Toilets
(stools; pollutant-purifn. **catalysts** loaded on
oxygen-deficient oxide supports for filters, **air**
purifn. app., and other commodities)

IT 65453-23-8P, Cerium zirconium oxide
(**catalyst** supports; pollutant-purifn. **catalysts**
loaded on oxygen-deficient oxide supports for filters,

air purifn. app., and other commodities)

IT 1306-38-3D, Ceria, oxygen-deficient, uses **1309-37-1D**, Iron oxide (fe2o3), oxygen-deficient, uses 1313-13-9D, Manganese oxide (mno2), oxygen-deficient, uses 1344-28-1D, Alumina, oxygen-deficient, uses 7631-86-9D, Silica, oxygen-deficient, uses
(**catalyst** supports; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

IT 7440-06-4, Platinum, uses
(**catalyst**; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

IT 7732-18-5, Water, processes
(**catalytic** decompn. of water for manuf. of hydrogen; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

IT **1333-74-0P**, Hydrogen, preparation
(**catalytic** decompn. of water for manuf. of; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

IT 50-00-0, Formaldehyde, processes 75-07-0, Acetaldehyde, processes **630-08-0**, **Carbon monoxide**, processes
(pollutant; pollutant-purifn. **catalysts** loaded on oxygen-deficient oxide supports for filters, **air** purifn. app., and other commodities)

L53 ANSWER 7 OF 8 HCA COPYRIGHT 2003 ACS on STN

135:274926 Production and storage of hydrogen from methane mediated by metal oxides. Otsuka, K.; Mito, A.; Takenaka, S.; Yamanaka, I. (Department of Applied Chemistry, Tokyo Institute of Technology, Tokyo, 152-8552, Japan). Studies in Surface Science and Catalysis, 136(Natural Gas Conversion VI), 215-220 (English) 2001. CODEN: SSCTDM. ISSN: 0167-2991. Publisher: Elsevier Science B.V..

AB A novel method for the storage and prodn. of hydrogen from methane mediated by metal oxides has been proposed. The method combines the **catalytic** decompn. of methane, the redox of metal oxides and the utilization of the deposited carbon as a chem. feed stock for the prodn. of CO or syngas. The hydrogen recovered through the redox of metal oxides does not contain a trace of CO, thus can be supplied directly to **H2-O2 fuel cells**.

IT **630-08-0P**, **Carbon monoxide**, preparation
(prodn. of **carbon monoxide** in storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)

RN 630-08-0 HCA

CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

$^{-}C\equiv O^{+}$

IT **1333-74-0P**, Hydrogen, preparation
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)

H—H

IT **1309-37-1**, Ferric Oxide, reactions **1317-61-9**, Iron Oxide (Fe3O4), reactions
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
RN 1309-37-1 HCA
CN Iron oxide (Fe2O3) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
RN 1317-61-9 HCA
CN Iron oxide (Fe3O4) (8CI, 9CI) (CA INDEX NAME)
*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST hydrogen storage prodn methane **catalytic** decompn metal oxide; **fuel cell** hydrogen storage prodn methane metal oxide
IT **Fuel cells**
(hydrogen-oxygen; storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides for)
IT Synthesis gas manufacturing
(prodn. of syngas in storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
IT Decomposition **catalysts**
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
IT Energy storage systems
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides for **fuel cells**)
IT **630-08-0P**, **Carbon monoxide**, preparation
(prodn. of **carbon monoxide** in storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
IT **1333-74-0P**, Hydrogen, preparation
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)
IT 74-82-8, Methane, reactions **1309-37-1**, Ferric Oxide, reactions 1312-43-2, Indium Oxide **1317-61-9**, Iron Oxide (Fe3O4), reactions
(storage and prodn. of hydrogen from **catalytic** decompn. of methane mediated by metal oxides)

L53 ANSWER 8 OF 8 HCA

135:7526 Method of starting and stopping methanol **reforming** apparatus and apparatus for supplying fuel to said apparatus. Naka, Takahiro; Sumi, Hideaki; Furuyama, Masataka; Isobe, Shoji; Hiramatsu, Yasushi; Yoneoka, Mikio (Japan). U.S. Pat. Appl. Publ. US 20010002043 A1 20010531, 17 pp. (English). CODEN: USXXCO. APPLICATION: US 2000-725808 20001130. PRIORITY: JP 1999-341442 19991130; JP 1999-341443 19991130; JP 1999-341444 19991130.

AB The present invention presents: (1) a starting method that is capable of quickly switching to the **reforming** process after warming up a **catalyst**; (2) a fuel supplying app. that is capable of maintaining a stable supply of a mixed water-methanol soln. while preventing water from freezing in a cold climate, and is also capable of immediately supplying a mixed water-methanol gas that has a compn. which is outside of the high-rate reaction region during the starting/stopping operation of the **reformer** when the control tends to be unstable; (3) a method to quickly cool down a **catalyst** layer without causing thermal runaway when stopping the operation of the methanol **reforming** app.; and (4) a method to quickly cool down the **catalyst** layer while preventing thermal runaway from occurring and removing residual fuel when stopping the operation of the methanol **reforming** app. In order to achieve the objects described above, the methanol **reforming** app. that generates a **hydrogen**-rich **gas** by reacting a mixed gas of water, methanol and **air** on a **catalyst** is supplied with the fuel from a fuel supplying app. comprising a mixed water-methanol soln. tank wherein the molar ratio of water and methanol used for **reforming** is controlled to a predetd. value, a mixed water-methanol soln. tank wherein the molar ratio of water and methanol is controlled to .gtoreq.4.6, and a switching means that switches the mixed water-methanol soln. tank used as a fuel source according to the conditions of operation of the methanol **reforming** app.

IT **7440-50-8**, Copper, uses **7782-44-7**, Oxygen, uses
(method of starting and stopping methanol **reforming** app. and device for supplying fuel to the app.)

RN 7440-50-8 HCA

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

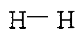
RN 7782-44-7 HCA

CN Oxygen (8CI, 9CI) (CA INDEX NAME)

O═O

IT **1333-74-0P**, Hydrogen, preparation
(method of starting and stopping methanol **reforming** app. and device for supplying fuel to the app.)

RN 1333-74-0 HCA
CN Hydrogen (8CI, 9CI) (CA INDEX NAME)



IT **630-08-0**, **Carbon monoxide**, processes
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)
RN 630-08-0 HCA
CN Carbon monoxide (8CI, 9CI) (CA INDEX NAME)

IC ICM A61L009-00
NCL 252373000
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST methanol **reforming** app operation **fuel**
cell hydrogen manuf
IT Fuels
Heat exchangers
Process control
Process dynamics
Reforming
Steam **reforming catalysts**
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)
IT **Reforming** apparatus
(steam; method of starting and stopping methanol
reforming app. and device for supplying fuel to the app.)
IT 7429-90-5, Aluminum, uses **7440-50-8**, Copper, uses
7440-66-6, Zinc, uses **7782-44-7**, Oxygen, uses
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)
IT **1333-74-0P**, Hydrogen, preparation
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)
IT 67-56-1, Methanol, processes 7732-18-5, Water, processes
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)
IT **630-08-0**, **Carbon monoxide**, processes
(method of starting and stopping methanol **reforming**
app. and device for supplying fuel to the app.)